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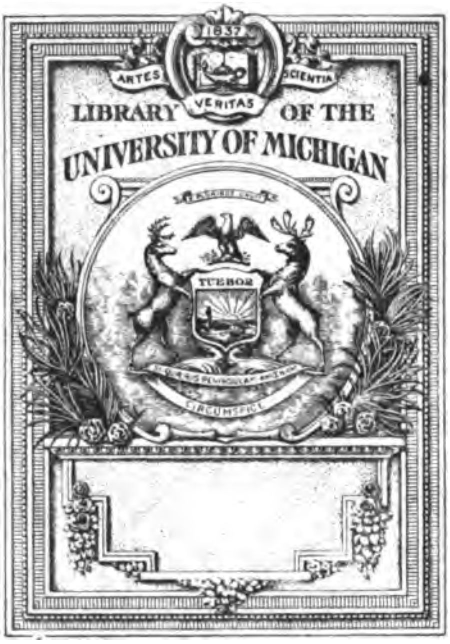

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THE BULLETIN OF
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OF PHILADELPHIA

VOLUME XV

JANUARY-OCTOBER, 1917

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1917

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The BULLETIN of the GEOGRAPHICAL SOCIETY of PHILADELPHIA

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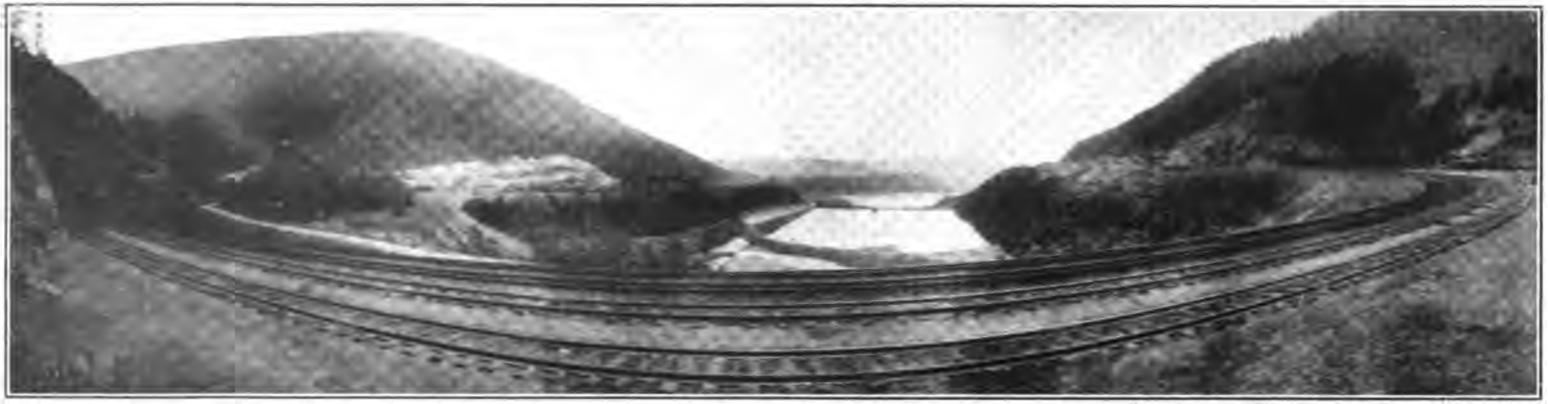

Plate IX. Horseshoe Curve at Kittanning Point, between Altoona and Gallitzin, where the Pennsylvania Railroad climbs to the Allegheny plateau. The view is looking east toward Altoona. The body of water seen in the center is the Altoona Reservoir, shown in Fig. 7. (See Fig. 7, pp. 10, 11.)

THE DEVELOPMENT OF TRANSPORTATION IN PENNSYLVANIA[1]

A. E. Parkins, Ph.D.,

George Peabody College for Teachers

IV. Rise of the Railroad in Pennsylvania.

There appeared in a May issue of the *New York Advocate* in 1825 the following comment: "We are gratified at perceiving that the subject of railroads is exciting considerable inquiry throughout the country, and in the same ratio that the canals were projected, commenced and executed, so will railroads, as we have reason to believe, be found in the most populous parts of the Union."[144] The same year an English work appeared in America bearing on its title page the description, "Observation on a general iron railway or land steam conveyance to supersede the necessity of horses on all public vehicles showing the vast superiority in every respect over all the present pitiful methods of conveyance by turn pike roads, canals, and coasting trades, etc."[145] The year 1825 marked about the beginning of the discussion in America of the coming mode of transportation.[146] England had already made many experiments and it was "supposed upward of $70,000,000" had already been invested in stocks of railroad companies.[147] In England the railroad rapidly superseded canals in spite of the fact that climatic conditions were especially favorable for canals, the operations at all seasons being little retarded by ice and drought. There were many arguments, many of which had geographic bases, advanced by the friends of railroads for their general acceptance. It was claimed that railroads would be less expensive to build and keep in repair. In England the cost of construction was not more than one fourth to one half that for canals; moreover, the railroads could be built in much less time than could canals. Transportation was less likely to be interrupted, for the railroad was uninfluenced by floods, frosts and drought and, therefore, offered transportation throughout the year. On canals much time was lost in lockage, a thing that would be avoided on railroads. The speed that would be attained on the railroad would be much greater than on the canal because the friction developed by a body passing through water increases as the square of the velocity.[148] The railroad would have a more extended range than the canal, for the latter were confined to regions of slight slope and where water could be obtained. Railroads would be able to pass over mountains, not being limited to water, and as for steep slopes, the locomotive could be assisted by stationary engines or by horses.[149] Most of these arguments,[150] though academic in tone, as judged by a generation acquainted with the developments of nearly a century in transportation, won adherents. By 1829 the public mind had become "more and more settled in the belief that railroads would supersede canals or at least be preferred unless the latter could be made under more peculiarly favorable circumstances, or for certain reasons shall be best fitted for some particular business."[151]

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[1] For the two preceding installments of this article, see the July and October, 1916, numbers.

[144] Quoted in Niles: *Weekly Reg.*, XXVIII, 191.

[145] *Idem.*

[146] See also Haney: Congressional History of Railroads, 22.

[147] Niles: *Weekly Reg.*, XXVIII, 68.

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[148] "Comparative Merits of Canals and Railroads."

[149] Niles: *Weekly Reg.*, XXXV., 229; *London Quarterly Review,* quoted in Niles: *Weekly Reg.*, XXVIII, 143; Haney: "Congressional History of Railroads," 16; *N. A. Review,* XXV, 65–67.

[150] One finds many of the same arguments advanced by different writers. The following quotation from the pen of J. D. C. is an evidence that these oft-repeated claims were extremely tiresome to people favoring canals: "If a railway can be constructed in any country where a canal could be made, and in many situations where canals are impracticable, through want of water—if loaded boats and wagons have been raised and let down 220 feet on some of them—if they can be completed and kept in repair for far less expense than canals, and do not occupy one fourth part of the room—if they cause no bilious or intermitting fevers in a country through which they pass—and if five or six wagons, each loaded with 20 cwt. can be impelled with a velocity of 10 or 12 miles per hour by means of one of Perkins' steam engines, expending two or three bushels of coal from Pittsburg to Baltimore; if these things be so, and they can all be demonstrated, is it not time to abandon impossibilities and think seriously on a subject of greatest importance?" (Baltimore, Federal Gazette, quoted in Niles: *Weekly Reg.*, XXV, 19.)

[151] Niles: *Weekly Reg.*, XXXV, 299.

1. *Early Railroad Building in Pennsylvania.*

Pennsylvania chartered a railroad in 1824 to run from Philadelphia to Lancaster over nearly the same route as that taken by the Lancaster Pike. Nothing having been done towards the construction, the legislature in 1826 repealed the charter, and two years later made provisions for the Philadelphia and Columbia Railroad.[152] This road was built as a part of the great canal line to Pittsburgh and so handled much through freight, but it also had a heavy short-haul traffic, traversing as it does the fertile limestone plain of Lancaster, which "from its prolific soil and rich cultivation" is one of the garden spots of the state. The Philadelphia and Columbia Railroad and that portion of the canal from Duncan's Island to Columbia were the only divisions of the great state work on which the revenues exceeded the expenditures during most of the period of their operation. These sections of the Pennsylvania Canal and Railroad were through the better settled portions of the state.[153] Branch lines from the Philadelphia and Columbia Railroad to West Chester, Harrisburg, and York were later constructed.[154] Tanner

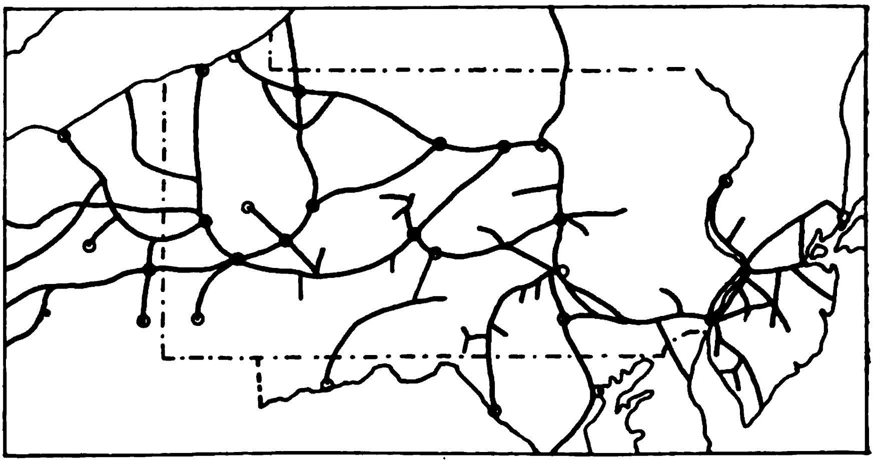

FIG. 5. The Pennsylvania R. R. System by 1876. Map from First Annual Report on the Internal Commerce of the U. S., 1876.

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[152] Tanner: "Canals and Railroads of U. S.," 1840, 114.

[153] Data from an Official Report, quoted in Niles: *Weekly Reg.*, LX, 188.

[154] Tanner: "Canals and Railroads of U. S.," 1840, 123.

lists, for 1840, more than thirty-six short lines, varying from seven to fifty miles in length, mostly in the eastern portion of the state. The construction of these lines is evidence that the Pennsylvanians were not wholly unmindful of the new era in transportation. The state officials, and consequently the majority of the people, however, still looked to canals as abundantly able to satisfy the needs of transportation and communication in most parts of the state. The state officials were undoubtedly actuated by a desire to hold the confidence of the people in the public works undertaken by the state. Governor Wolf in 1831 was of the opinion that "the commencement of any new project" in internal improvements at that time should be "depreciated and considered . . . as being entirely unpolitic, as intending to embarrass and delay the operation of the government in completion any portion of the public works."[155] But while the attention of Pennsylvania was engrossed in the development of its great system of canals, New York, Baltimore, and other cities were actively interested in the building of railroads.

2. *The Struggle for the Traffic of the Interior.*

Baltimore was the center of the railroad propaganda in the late 1820's and early 1830's, and was the first city to project a railroad across the mountains to the interior. The reasons for this activity are evident. New York in 1825 had opened the Erie Canal and its success as shown in the increase of tonnage every year stimulated the other states to activity. Pennsylvania from 1826 to 1834 was busy pushing its great canal project to the forks of the Ohio. Baltimore, on the other hand, having seen two attempts to reach the Ohio by way of the Potomac doomed to failure, because of adverse geographic conditions,[156] turned naturally to the only other possibility of realizing the hopes cherished for so long of controlling the

[155] Quoted in Niles: *Weekly Reg.*, XL, 151–152.

[156] The report of the United States engineers on the Chesapeake and Ohio Canal dampened the enthusiasm of the majority of the people of Baltimore for canals. The engineers reported that it would cost $22,375,427.69 to construct the canal, 241 miles, to the Ohio Basin, and that 398 locks would be necessary to overcome the Allegheny Mountains ridge (3,158 feet A.T.). The canal was planned to terminate at Georgetown. This was objected to by Baltimore. (Reizenstein: Economic History of B. & O. R. R., J. H. U. S., 15th Series, Nos. 7 and 8, 10.)

major part of the traffic of the interior. In 1827 the Baltimore and Ohio Railroad Company was incorporated and for the next few years steadily pushed its track up along the Potomac, in spite of the many legal battles fought with the Chesapeake and Ohio Canal Company.[157] Philadelphia was driven to railroad building by the example of both Baltimore and New York.

In 1839 before the state had decided to dispose of the public works, the legislature appropriated $30,000 to bear the expenses of a survey of the feasible routes for a railroad from Harrisburg to Pittsburgh. The commission making the survey reported that there were three feasible routes, namely, a northern, middle and southern. The northern was by way of the west branch of the Susquehanna to its headwaters, which are well beyond the Alleghany Front, and

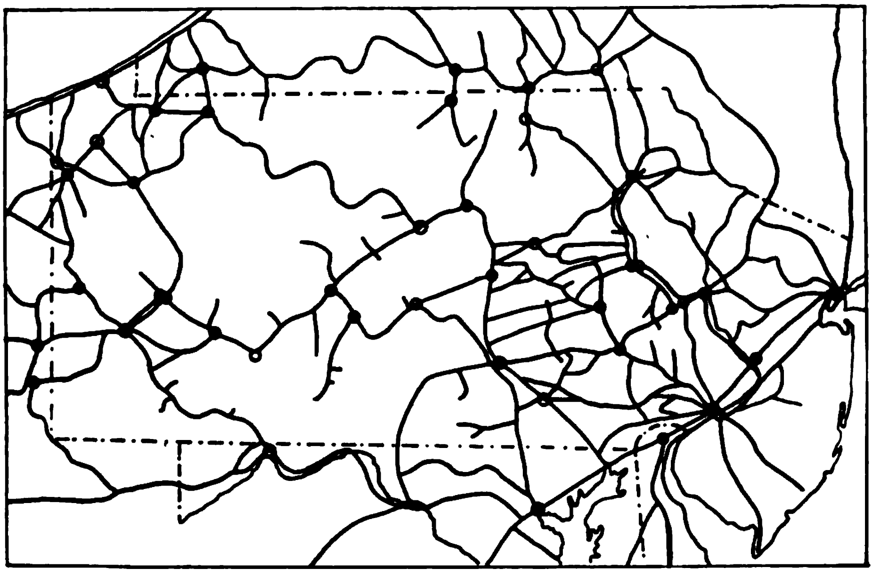

Fig. 6. The Railroads of Pennsylvania about 1872. Based on Appleton's "Handbook of American Travel." "Western Tour," 1873; Auditor General's "Report on Canals, Railroads, and Telegraphs," 1871. The strong influence of topography on railroad distribution is well shown. Compare this map with the road map for 1832.

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[157] Niles: *Weekly Reg.*, XXXVI, 41; Poor: "Manual of Railroads," 1868–69, 16.

over the divide, to a tributary of the Allegheny River. Although this route is more circuitous than the others, it avoids the steep grades of the eastern slope of the Allegheny Front. This line is now followed by the Philadelphia and Erie Railroad, which crosses the summit between the eastern and western waters at 1,450 feet above tide.[158] The central route followed in general that of the Pennsylvania Canal, and the southern that of the Philadelphia-Pittsburgh Pike. The state did not carry the matter of providing a railroad any farther than making the survey, for in the early 1840's the state public works were disposed of, and the construction of the Philadelphia and Pittsburgh Railroad was left to private enterprise. (See section on canals.)

The failure of the state to engage in railroad construction did not prevent much discussion of the need of such a railroad line. It was plainly evident that the canal would not continue to give Philadelphia the advantages over her adversaries that was expected, for all about Pennsylvania saw the more efficient railroad projected and building. The activity of the other states in railroad building became all the more active as the years went on. In New York, by 1842, an all-rail communication between Albany and Buffalo was completed and there was much discussion of a second line to connect New York with Lake Erie by a more direct route. Boston in the meantime had reached "forth her iron arms to grasp in her embrace the glittering prize of the great West"[159] by opening a line from Boston to Albany in 1841. Canada, by the help of Great Britain, was "striving to direct the stream of glittering wealth into her coffers."[160] While Baltimore on the south was "pressing in the same noble contest."[161] The Baltimore and Ohio had in 1842 reached Cumberland and efforts were now made to secure a right of way to Pittsburgh. In the legislative session of 1846, the "railroad controversy was great and exciting" and there were many "log rolling maneuvers" resorted to by the various sections of the state for the attainment of their interests. The people of northeastern Pennsylvania wished connections with the New York improvements, for with the railroad this would enable them to get their produce to the market and obtain their supplies with the greatest facility. During the river and canal periods (see sections on rivers and canals) the natural market for this section of the state was down the Susquehanna to Baltimore or Philadelphia. It will be recalled that ascending navigation from Baltimore was difficult and northeastern Pennsylvania, being much nearer New York than Baltimore or Philadelphia, made most of its purchases in the nearest city. Western Pennsylvania demanded connection with the Maryland improvements, for this would shorten the distance to market. It urged the legislature to grant the Baltimore and Ohio Railroad the right of way to Pittsburgh. Philadelphia and central Pennsylvania "resisted might and main" both the Northeast and the West. Philadelphia objected most strenuously to the granting of the right of way to the Baltimore and Ohio, for such would have a "tendency to divert the trade of the West from the Pennsylvania emporium to a rival city, Baltimore." In an attempt to divert the attention of the legislature the Philadelphians projected, what was termed, "a central railroad of Pennsylvania," which would give the West the needed connections with a tidewater emporium, Philadelphia, and be a trunk line from which branch railroads could be constructed to the various parts of the state. The Philadelphians nominally failed in this attempt to forestall the people of Baltimore, as they failed many years before in the attempts to prevent the building of the Baltimore and York Railroad and the Baltimore and Susquehanna Canal. The bill granting the Baltimore and Ohio the right of way was passed, but with "onerous restrictions." As a compromise a central railroad in Pennsylvania was also chartered with the provision that should the Pennsylvanian company go into operation within a stated time and progress with the road at a stated rate, the privilege granted the Baltimore and Ohio to continue the work to Pittsburgh would be null and void. These were the "onerous restrictions."[163]

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[158] Flint: "Railroads of U. S.," 449.

[159] Niles: *Weekly Reg.*, LXIX, 169.

[160] *Idem;* Poor: "Manual of Railroads of U. S.," 1868–69, 16.

[161] Niles: *Weekly Reg.*, LXIX, 168; Flint: "Railroads of U. S.," 54.

3. *The Pennsylvania Railroad to Pittsburgh.*

It was plainly evident to many in Pennsylvania that something must be done to "provide a better avenue of travel between Philadelphia and the interior" than then existed. Attempts were made to secure state action or coöperation.[163] But failing in this, Philadelphia merchants formed a company for the construction of the Pennsylvanian Railroad. The great need for a continuous railroad "fitted to become a great route of travel as well as commerce" was the main factor in procuring funds for its construction.[164]

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[163] Niles: *Weekly Reg.*, LXIX, 405, Feb. 28, 1846; *Idem*, LXX, 144, May 2, 1846; *Idem*, LXX, 214, June 6, 1846.

The Pennsylvania Railroad (see section on canals) follows the middle route of the survey of 1842, paralleling the Pennsylvania canal from Harrisburg to Pittsburgh, except over the Allegheny Front where the summit is crossed at about 2,200 feet A.T., involving grades of ninety-five feet to the mile. Inclines are avoided by a "horseshoe curve" on the slopes of the valley of Burgoon Run, and by a long incline along a spur of the Allegheny Front and thence along the north slope of the valley of Sugar Run. Sugar Run gap is pierced by a tunnel to the east of Galitzen (see Fig. 7).[165] For many years the eastern terminus of the road was at Harrisburg, communication with Philadelphia being secured by the Harrisburg and Lancaster Railroad and the state-owned Philadelphia and Columbia Railroad. This arrangement shows a lack of appreciation of the importance of terminals. Many of the early roads were built for local business only or to connect waterways, with little regard to the importance of securing an outlet to the great markets. The managers of the Pennsylvania Railroad soon found the transportation conditions on the Philadelphia and Columbia Railroad "uncertain and frequently adverse," and the arrangements were "not at all suited to their purpose." The Harrisburg and Lancaster Railroad was leased and the Philadelphia and Columbia Railroad was purchased outright with the other divisions of the Pennsylvania Canal and Railroad. Thus was secured "harmonious action" throughout the line from Philadelphia to Pittsburgh and this "at once imparted new life and vigor to the enterprise and ensured its prosperity."[166]

Andrews in 1852 said of the Pennsylvania Railroad: "As a through route, both for trade and travel, there is hardly a work of the kind in the United States possessing greater advantages or a stronger position." He considered the region through which it passed "one of the best in the country for local traffic, possessing a fertile soil and vast mineral wealth in the coal and iron deposits." From each of these sources a large business was expected and the whole region, he believed, could not "fail in time to become the seat of great manufacturing interests for which the coal and iron on the route would furnish abundant material."[167]

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[163] *Idem*, LXIX, 405.

[164] Andrews: "Colonial and Lake Trade," 314.

[165] Hollidaysburg and Ebensburg sheets, Topographic Maps, U. S. G. S.

[166] Report of J. Edgar Thompson, president of Pennsylvania Railroad, quoted in Flint: "Railroads of U. S.," 114.

The importance of the railroad to Philadelphia was early demonstrated. Even before the connection between the eastern and western sections was complete, Philadelphia, as was the case with the Pennsylvania Canal, drew a large trade, which formerly went to New York, and since then it has contributed to the prosperity of Philadelphia in a large degree.[168] The country traversed by the Pennsylvania Railroad had been partially developed by the Pennsylvania Canal, but the railroad made transportation cheaper and quicker than by canal and business responded rapidly. Through traffic on the canal had always been insignificant. The railroad had to create this sort of traffic. The rapid growth of the interior, both in population and wealth, made an immense through traffic available. Pennsylvania, destined by geographic conditions to a land traffic and communication, had at last found a method of transportation that could compete successfully with those of other states. Although New York has the advantage of grades,[169] Pennsylvania has the advantage in distance. The Pennsylvania Railroad constitutes from New York the shortest distance to central Ohio, much shorter than any offered by the railroads of New York, and with its Chicago extension connects four of the great cities of the country, New York, Philadelphia, Pittsburgh and Chicago, in a direct route from the interior to the Atlantic seaboard.

The railroad tended to reduce the great advantages that Baltimore, because of its position, had had over traffic originating in Pennsylvania or crossing Pennsylvania; for, with the reduction in the cost of transportation, the cost of trans-shipment became a more important factor in fixing transportation charges than in the early days. Goods once on the car would be carried through to Philadel-

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[167] *Loc. cit.*, 314-315.

[168] Andrews: "Colonial and Lake Trade," 115.

[169] *Journal of Geography*, IX, 113-118.

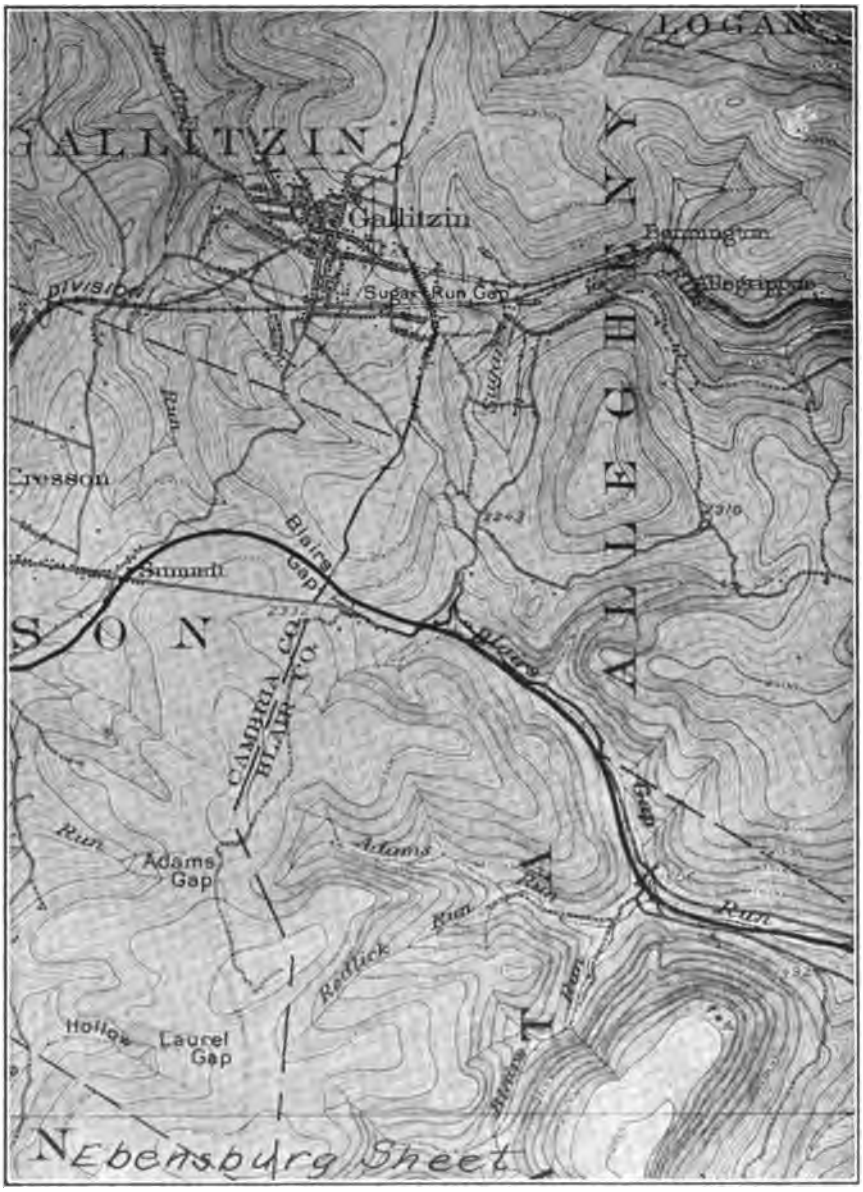
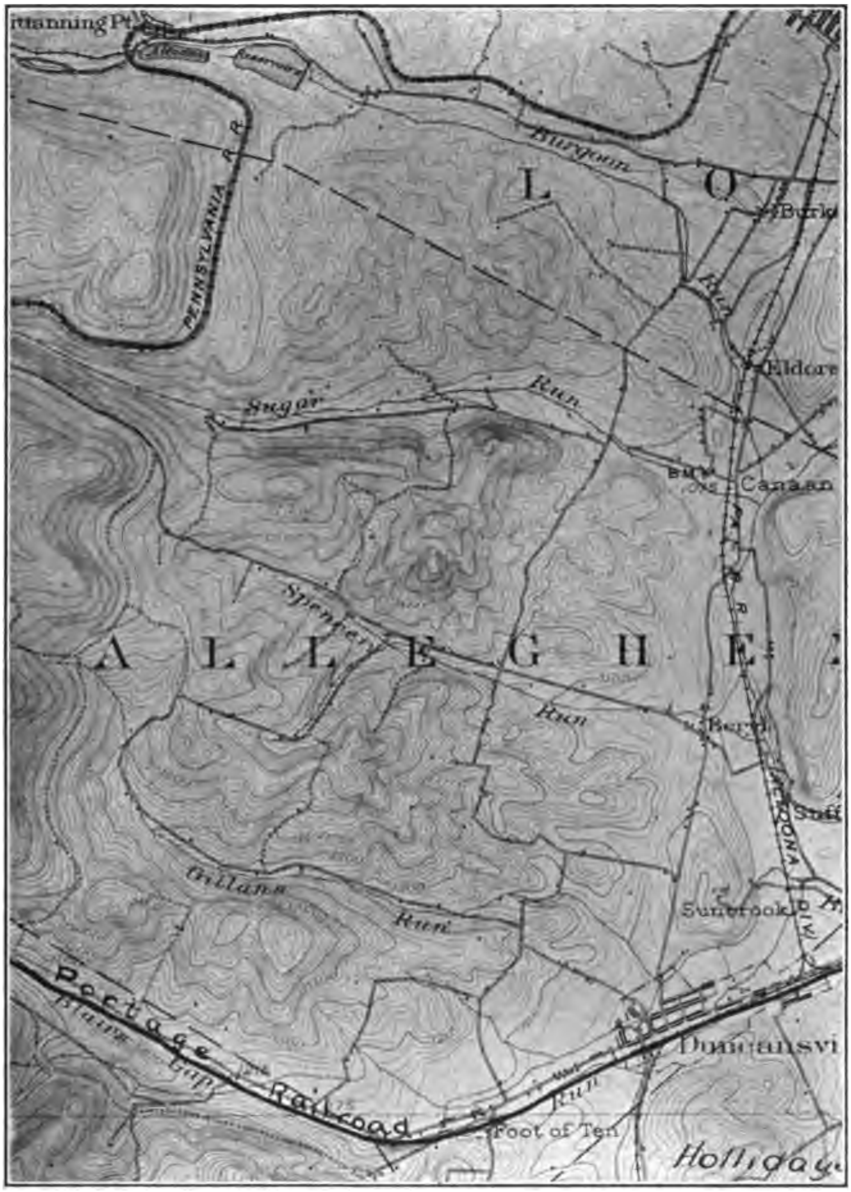


FIG. 7. Blair's Gap and Sugar Run Gap across the Allegheny Front, west of Altoona and Hollidaysburg. The Portage Railroad is shown in the heavy line. The "Horse Shoe Curve" of the Pennsylvania Railroad is at Kittanning Point. See Plates V, VI and IX and text, p. 8. Note the altitudes of



2300 to 2600 feet about Gallitzin, which is on the surface of the plateau, and the abrupt descent over the escarpment to the east. (From Ebensburg and Hollidaysburg quadrangles U S. Geol. Survey. Contour interval 20 ft.)

phia rather than be trans-shipped for Baltimore at Harrisburg or Columbia, as was customary in the days of roads and canals.

4. *The Development of Feeders to the Pennsylvania Railroad.*

By the time the Pennsylvania Railroad was opened for traffic between Pittsburgh and Philadelphia, other traffic lines had become well established. The steamboat on the Ohio and the Mississippi was at the height of its activity. In 1848 it was reported that there were 1,200 steamboats on the rivers of the interior. New Orleans was in the height of its prosperity. In 1855–56 the domestic exports of the city, amounting to $80,000,000, were all carried by water.[170] The Hudson River had been connected with Lake Erie by rail in 1842, and the Erie Railroad had been opened from New York City to Dunkirk in 1851.[171] The canals of Ohio were fast making that state a commercial province of New York, more than 1,000 miles of canals having been constructed between 1830 and 1850, giving thirty-seven counties of the state an outlet to Lake Erie.[172] The Baltimore and Ohio had reached Wheeling in 1853 and was cutting into the down river traffic of New Orleans. Much of the traffic of the area to the west of Pittsburgh had by 1854 found transportation lines to the seaboard and most of these lines tended to divert the commerce from Pittsburgh, which through the "dog-in-the-manger" policy of Philadelphia and central Pennsylvania was prevented from being reached by the Baltimore and Ohio and possibly other lines. Had Pittsburgh had connections to the east a year or two earlier than it did, there would have been a tendency for railroad lines to be built towards Pittsburgh, making it a railroad center for the roads of Ohio. Since the Ohio River could not be depended on as a certain feeder for the Pennsylvania Railroad, the company was forced to construct its own feeders westward from Pittsburgh (see Fig. 5). Lines were selected that would put Pittsburgh in touch with Cincinnati, Columbus, Cleveland, and Chicago. Through connections were made between Philadelphia and Chicago in 1856.[173]

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[170] James J. Hill: "Highways of Progress," 212.

[171] Andrews: "Colonial and Lake Trade," 291.

[172] Chaddock: "Ohio Before 1850," 23.

[173] Flint: "Railroads of U. S.," 104, 115, 119, 126.

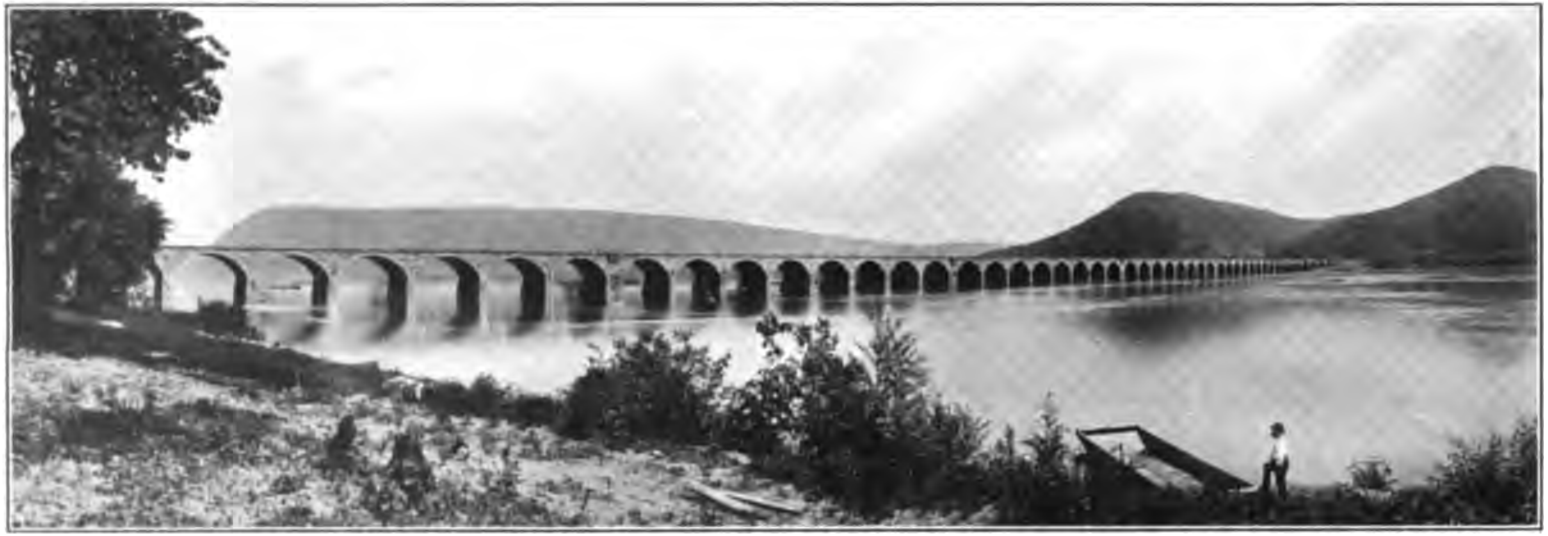

PLATE X. The New Stone Bridge by which the main line of the Pennsylvania Railroad is carried over the Susquehanna River at Rockville, Pa., near Harrisburg.

5. *Some Other Important Railroad Lines.*

The second most important railroad in the state in 1852 was the Philadelphia and Reading Railroad, extending from Philadelphia to the Schuylkill coal fields, a distance of about ninety miles. It was constructed for heavy traffic and the great amount of grading necessary in such a rough country made it one of the most expensive railroads in the United States, its cost being $17,000,000, nearly $190,000 per mile. In 1851 nearly 2,000,000 tons of coal were transported over the road. It was believed that the enormous coal traffic which this road secured to Philadelphia was one of the causes of the extraordinary increase of population of that city from 1840 to 1850.[174] The Williamsport and Elmira Railroad was completed in 1846, connections being made with Baltimore and Philadelphia by the Susquehanna Branch of the Pennsylvania Canal, or by the Baltimore and Sunbury Railroad from Sunbury. The Baltimore and Sunbury was another Baltimore project incited by the favorable position of that city with respect to the major transportation lines of Pennsylvania and designed to capture a part of the traffic of the Susquehanna basin. By 1854 Baltimore and Philadelphia had all-rail communication with Elmira, and shortly after with Canandaigua on the New York Central Railroad in central New York. These railroads to the upper basin of the Susquehanna made possible a return trade, a thing the rivers prevented and a thing that worked materially against the early mercantile growth of both Baltimore and Philadelphia.

Construction work on the Philadelphia and Erie Railroad, designed to connect Philadelphia and Lake Erie, was begun about 1860. Before the completion of the road the Pennsylvania Railroad Company leased the line for a long term of years. This railroad passes through a region which for many years was much retarded in its development, due to the highly dissected condition of the topography and its location between the lines of westward advance in Pennsylvania and New York. Until the coming of the Pennsylvania and Erie Railroad, products sent to market consisted mainly of logs borne on the waters of the Susquehanna. Little grain was raised for export, and even live stock was scarce. Much of the land was held by capitalists in New York, Philadelphia, and Europe, who were waiting for a rise in the price of land sure to take place with the introduction of the railroad. The railroad brought many settlers. New settlements sprang up all along the line and hundreds of farmers purchased land in the fertile valleys.[175]

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[174] Andrews: "Colonial and Lake Trade," 315

The state within a decade after railroad construction began was much more thoroughly provided with transportation by rail than it had ever been by turnpikes and canals. In 1860 Pennsylvania had 2,598 miles of railroads and ranked fourth among the states in railroad mileage, being surpassed by Ohio, Illinois, and New York (see Fig. 6). From about 1880 to about 1900 it ranked second, and in 1910 it was third in the list. In 1910 there were 11,290 miles of steam lines in Pennsylvania.[176] In spite of the adverse topographic conditions the railroads are well distributed over the state. There are only a very few areas more than ten miles from a railroad. Such areas are to be found in south central Bedford County, central Fulton County, eastern Pike County, and a small area crossed by the boundary of Bradford and Susquehanna counties. In 1912 Pennsylvania, on the average, had 25.56 miles of railroads to every 100 square miles of territory, and ranked third among the states. New Jersey had 30.69 and Massachusetts 26.3. There are many areas, however, though only a few miles from a railroad in a direct line that are as isolated as in the days of canals. Some of the narrow-canoe-shaped valleys, rimmed about, for the most part, by steep-sided ridges, extending transverse to the main line of transportation, and devoid of mineral resources, are too small to furnish sufficient business to warrant the construction of even a branch line.

6. *Railroads and Topography in Pennsylvania.*

In few other states in the Union has topography had so great an influence in determining the course of transportation as in Pennsylvania. In both the ridge and plateau sections of the state the railroads are forced to follow for the most part the natural drainage lines. In the ridge region the drainage lines are of two types: those of the antecedent streams run in general transverse, while those of the subsequent streams, parallel to the ridges. There are accordingly two types of transportation lines, those extending from northeast to southwest in broad arcs following the long narrow valleys between the ridges and those transverse to these along the antecedent streams. The Susquehanna with its branches is the more important of the antecedent streams. The watergaps carved in the great sandstone ridges, as the rivers etched their way into the softer rocks, offer the only feasible transportation lines across the ridge region. In the plateau section the railroads are in general forced to follow either the valleys or the ridges between them. In either case their courses are determined by the drainage lines. By far the larger part of the railroad mileage is found in the valleys. The highly meandering course of the antecedent streams lengthen the mileage on many of the railroads to 50 or more per cent. of the air-line distances. This is certainly a serious factor when cost of construction and time and cost of transportation are considered. Yet the necessity of the railroads following the drainage lines is of great value in railroad strategy, and has been a factor no doubt in the rapid development of the railroad mesh. Topographic conditions are such that the number of lines that may be built to a given area are, in many cases, limited to a few. Such being the case, when the right of way along a route has once been secured, the probability of competing lines being constructed is slight. Capital stands ready to contribute to the construction and thorough equipment of such lines. The Pennsylvania Railroad from Philadelphia to Pittsburgh and the Philadelphia and Erie well illustrate the point in question. According to an early president of the Pennsylvania Railroad Company, these two lines occupy "the only routes within this commonwealth upon which a railway for through business can be built and yield a reasonable return upon the capital that may be expended in its construction. Upon all other routes several additional mountain summits will be encountered, beside an increased cost hereafter of constructing such a work." Because of this strong influence of topography it was believed the company might safely make extensive outlays for the development of traffic along these routes.[177] No doubt the early activity of the Pennsylvania Railroad Company in securing the control of the strategic routes is one of the chief reasons for the dominance of that great company in the railroad field in Pennsylvania.

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[175] Flint: "Railroads of United States," 113–123.

[176] Statistical Abstract of U. S., 1913.

[177] Report of J. Edgar Thompson, President, Feb. 5, 1868, quoted by Flint: "Railroads of U. S.," 446.

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THE INFLUENCES OF GLACIATION IN OHIO.[1]

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OUTLINE.

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3. The Influence of Glaciation on Drainage and Water Supply.
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I. THE PHYSICAL CONDITIONS.

Introduction.—Early in the study of the glacial limits in Ohio important differences were recognized between the drift-covered and the driftless areas of the state. At that time Wright[2] emphasized the influences of glaciation on the character of the soil, on the contour of the country, and on the minor lines of drainage, concluding that the "ice-sheet pretty much made the most fertile portions of the state." Little or no work has been done since in Ohio to test such a broad generalization. Indeed, the literature bearing on the general subject is surprisingly meager, and with a few notable exceptions[3] deals only in broad generalizations.

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[1] Originally written under the direction of Professor Barrows, of the University of Chicago, to whom the author is much indebted for helpful criticism.

[2] Geol. of Ohio, Vol. V, p. 767.

The definite determination of the influences of glaciation is not an easy problem, for it is difficult, in some cases perhaps impossible, to know what conditions would exist had glaciation not occurred.[4] An approximation to the truth, however, is a comparison of areas, alike or nearly alike, in essential features, except for glaciation. The fundamental factor in such a study necessarily is the comparableness of the areas: (1) the areas should be large enough to minimize the effects of purely local conditions tending to modify results, but not so large as to introduce important factors in the one area not found in the other. Very large areas are likely to involve disturbing contrasts in climate, in topography, in natural resources, in crops grown, in commercial advantages, and in other less obvious ways. (2) It is difficult to evaluate influences originating outside the area in question. The business relationships of northern Ohio are almost wholly with or through a glaciated country. Had none of this been glaciated, the routes of trade and the development of cities undoubtedly would have been different. Yet how much of the development of northern Ohio is due to such factors is a problem in itself. (3) There are many factors unrelated to glaciation, some of them entirely non-geographic in character, which have influenced economic development profoundly. Moreover, the conditions making such factors possible in some cases disappeared long ago, leaving only the effects. Judged on this basis, the glaciated and non-glaciated sections of Ohio lend themselves especially well to such comparison. Although conditions are not altogether ideal for the purpose, they are, for the most part, highly favorable.

Fortunately for statistical comparison the glacial limit[5] corresponds rather closely with the boundaries of a number of counties, the smallest units for which census data are available. For purposes of comparison counties crossed by the edge of the drift are

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[3] Hubbard, *Bull. Am. Geog. Soc.*, Vol. XXXVI, pp. 145–157. Whitbeck, *Annals Assoc. of Am. Geogs.*, Vol. III, pp. 62–87. Von Engeln, *Bull. Am. Geog. Soc.*, Vol. XLVI, pp. 241–264, 336–355.

[4] See Claypole, *Am. Nat.*, Vol. XX, pp. 856–862, Buffalo and Chicago, or "What might have been."

[5] See Fig. 1.

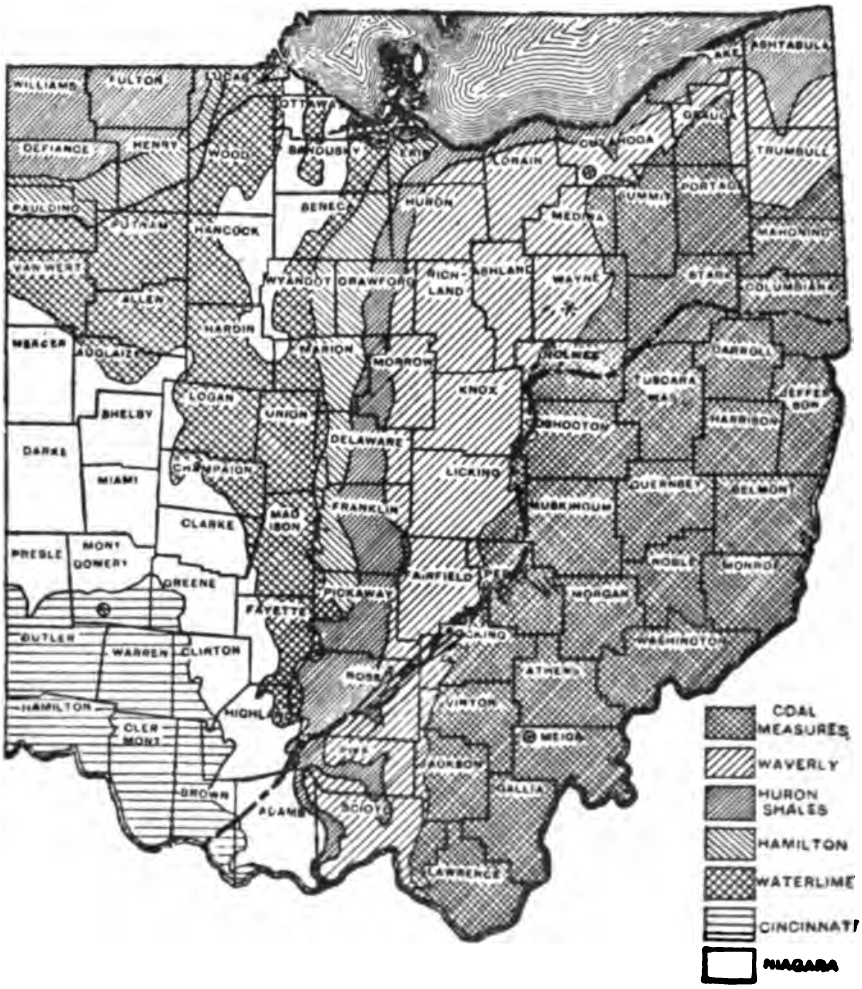

Fig. 1. Geological Map of Ohio, showing the glacial boundary.

considered glaciated if more than half-covered with drift, and as unglaciated if less than half-covered. On this basis, Brown, Ross, Holmes, Stark and Columbiana counties are counted with the glaciated; Adams and Perry with the non-glaciated. This gives the glaciated area sixty-five and the non-glaciated area twenty-three counties, with 73.5 per cent. and 26.5 per cent. respectively of the total area[6] of the state. These percentages, in general, may be taken as a "measuring stick" for the two areas, provided the two sections are shown to be comparable.

The Influence of Glaciation on Topography.—There is a marked contrast in the topography between the glaciated and non-glaciated sections, although the line separating the two is not everywhere very definite. For the most part, the glaciated region is of the gently rolling, ground-morainic type of low relief with some extensive level or nearly level tracts. Along some of the streams, however, the land is extremely rough; especially is this true in the area of the older drift-sheet along the lower courses of the major rivers flowing into the Ohio. This is due in part to the greater erosion, both pre- and post-glacial, and in part to the fact that southwestern Ohio is covered less heavily with drift, so that the pre-glacial relief is not concealed.[7] Most of the state lies between 500 and 1,000 feet, and it is noteworthy that the highest point in the state as well as the major areas above 1,000 feet are in the glaciated part. In the non-glaciated section there is little flat land, and the rivers flow in narrow channels between well rounded hills and ridges rising 300 to 500 feet above the river beds.

The contrast in topography between the two sections is due largely to the fact that the old, deeply dissected topography of the glaciated section is buried under a mantle of drift of varying thickness. The drift is sufficiently thick, for the most part, to mask completely the old erosion forms. The greater thicknesses of drift encountered here and there, as in Champaign Co. (530 feet), are in old valleys and suggest what the present topography might be were the area driftless. Some of the well records show that the rock is carved out below the level from which water could be carried by the present drainage lines.[8] The deep excavations shown in the Cleveland well (238 feet), the Dayton well (247 feet) and the Hamilton well (214 feet), as well as the Cincinnati well (120 feet), are examples of this sort. At these and other points the erosion had reached several hundred feet below the present drainage levels of the districts in which these wells are located.[9] It is noteworthy that the present poorly drained Erie-Ohio watershed did not exist; instead large trunk streams crossed this area with narrow, steep-sided channels about 300 feet deep.[10] Were all the old drainage lines well known[11] it would be difficult to estimate their importance to the modern industrial and commercial world, were they surface features. However, a dissected peneplain[12] and the topography that would accompany such a drainage system, together with the associated economic restrictions must be considered from the standpoint of most human activities as far inferior to the conditions present to-day in glaciated Ohio.

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[6] U. S. Census Bull., pop. 1910, p. 10.

[7] Leverett, 10th Ann. Rept. U. S. G. S., Pt. IV, pp. 427–429.

[8] Leverett, Monograph, XLI, U. S. G. S., pp. 318–320.

The Influence of Glaciation on Drainage and Water Supply.—Lakes and swamps are characteristic of young drift plains; and glaciated Ohio is no exception. Not only was there the Great Black Swamp in the northwest, but there were many smaller ones, especially along the northern watershed.[13] For the most part, the forested areas were poorly drained, and in places the water stood on the surface during much of the year. Ohio is little known as a region of lakes, yet at the time of settlement there was a perfect network of them along the Erie-Ohio divide, while many others were scattered throughout the state. Within twenty miles around Cuyuhoga Falls in Summit County, Newberry mapped nearly a hundred lakes and concluded that "these cisterns on the highland are among the most useful features in our topography, and if they should be drained a long train of resultant evils would be experienced by the inhabitants."[14]

When the pioneer came to Ohio many glacial depressions still contained small lakes, others were swamps or peat bogs, while still others had passed through these stages and soon were ready for the plow. Most of these depressions have been drained since and form now some of the richest land of the state. These wet lands, although they have delayed the settlement of certain regions, were not an unmitigated evil. They were the storehouses for small springs and streams whose importance in the economy of the early settler it is difficult to overestimate. Even where running water was absent a shallow well, easily dug in the drift, supplied the needs of the family and stock, because the water table throughout the year stood comparatively high. Leverett[15] estimates that for the glaciated portion of the state there are "probably twenty-five groundwater wells for every deeper well, whether in drift or rock." In 1914 Flynn and Flynn[16] reported many cities dependent wholly or in part on water coming from gravel beds within the drift.[17]

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[9] Orton, Geol. of Ohio, Vol. VI, p. 782.

[10] Leverett, Monograph, XLI, U. S. G. S., p. 103.

[11] See Light, Prof. Paper 13, Pls. I-XVII. Chamberlin and Leverett, *A. J. S.*, 3d Ser., Vol. XLVII, pp. 247-283. Upham, *Bull. G. S. A.*, Vol. VIII, pp. 7-13. Bownocker, *Am. Geol.*, Vol. XXIII, pp. 178-182.

[12] Bowman, "Forest Physiog.," p. 462.

[13] Claypole, Proc. A. A. A. S., Vol. XXX, p. 152.

[14] Geol. of Ohio, Vol. I, Pt. I, pp. 47, 206.

The Influence of Glaciation on Soils.—Another major influence of glaciation has been on the soils of the state. Were all the soils residual there undoubtedly would be great local contrasts, but only minor differences in the main between the sections under consideration. The glaciated section is favored somewhat by being underlain more widely by limestone, but the strongly dolomitic character of much of the limestone makes it less soluble and consequently less valuable as a soil maker. Many calcareous shales make better soils than dolomites. In the non-glaciated section the fertility of the soil has more relation to slope than to the underlying formations. The bottom lands have the fertile soils while the slopes have the thin soils. Were all the soils residual, other things being equal, the area now glaciated would have on the whole a slight advantage in natural fertility; a fact which needs to be kept in mind when drawing general conclusions.

The soils of the glaciated section, however, were improved greatly by glaciation: (1) As the ice advanced it eroded the prominences and filled the valleys, thus reducing the relief very materially. This not only increased greatly the amount of land available for strictly agricultural purposes, but also greatly reduced soil erosion and leaching. (2) Under the enormous weight of the ice-sheet much rock was ground very fine, as is shown by the character and thickness of the drift-sheet. This has been of especial value because of the large areas of the hard dolomitic limestone which thus became much more soluble. Not only the thickness of this loose mantle rock but its trituration as well has been of immense value in providing a deep subsoil, unleached and ready to give up its mineral plant food. (3) This ice-ground material was mixed thoroughly. There was more or less of a mixing of fine and coarse

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[15] 18th Ann. Report, Pt. IV, U. S. G. S., p. 476.

[16] U. S. G. S., Water Supply Paper No. 91, pp. 74-91.

[17] Burke, *J. Cin. Soc. of Nat. Hist.*, Vol. II, p. 69.

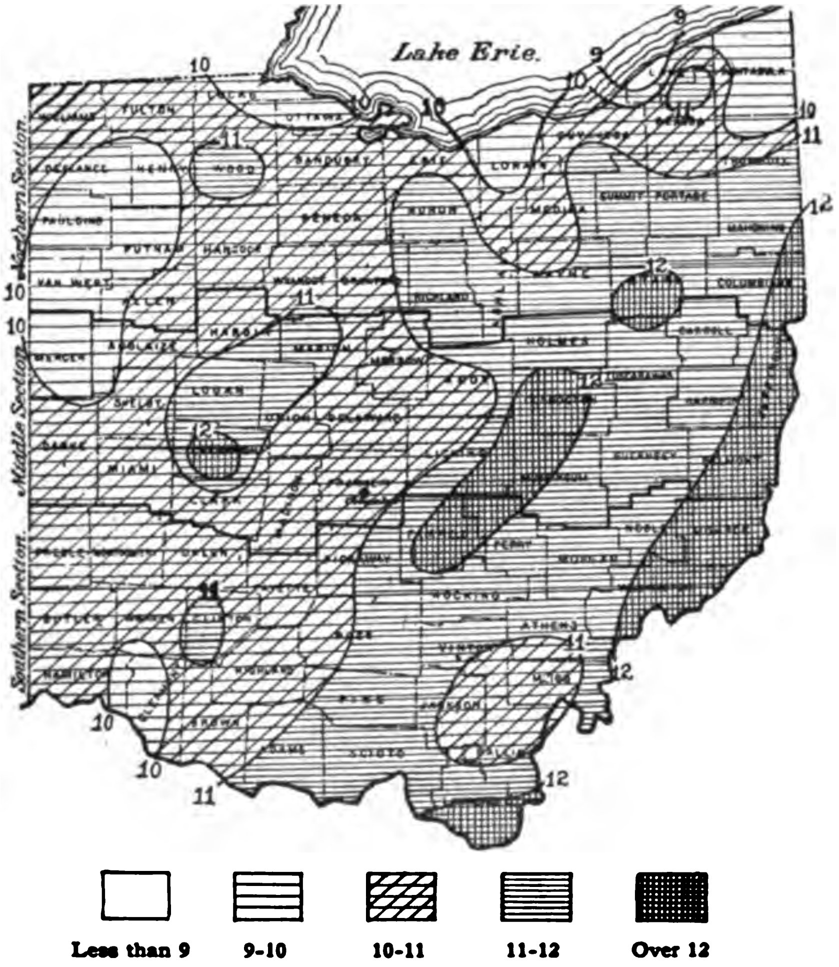

FIG. 2. Average Amount of Precipitation in Ohio in Summer. Scale of Shades—in inches. This chart illustrates the rainfall for the state during the summer months, June, July and August. The amounts range from slightly below 9 inches to over 12 inches. In general the southeastern half of the state receives considerably more rain than the northwestern.

particles, of local rock of different composition, and of imported rocks of various formations. As a result the clayey soils are more sandy and the sandy soils more clayey, with more or less of an admixture of ground limestone in both. The former have thus become more porous, less heavy and tenacious, the latter more resistant to drought and more productive.

The Influence of Glaciation in the Non-glaciated Section.—The influence of glaciation is felt even in the non-glaciated section.[18] During the ice period such south-flowing rivers as the Muskingun, Licking, Hocking and Scioto were overloaded with material from the ice, and aggraded their valleys to the height of eighty feet or more above the present stream bed.[19] With the disappearance of the ice, the rivers started to cut new channels, but have not yet reached their former level nor given the valleys their former width. The higher remnants of the valley trains form "drift terraces" of considerable agricultural value, and being relatively dry and easily drained, and near an abundant water supply, they afford excellent sites for cities and towns. Zanesville, Marietta, Lancaster, Gallipolis, Ironton, Portsmouth, and many lesser towns are built upon them. The advantages of these terraces were recognized even by the Mound-builders, for many of their works were found upon them. Closely associated with the valley trains and their terrace remnants are the so-called "back-water terraces" in the tributary valleys which were silted up at the same time, and whose subsequent history is similar. It is particularly noteworthy that the river bottom lands of the driftless area are made primarily of glacial outwash material deposited at the time of the ice-sheet. These bottom lands are by no means an insignificant factor in this area, for in Washington County alone there are about 32,650 acres[20] of such land. These lands undoubtedly have added considerably to the agricultural possibilities of the section, for had it not been for glaciation, its bottom lands would have been much less extensive.

II. THE ECONOMIC CONDITIONS.

It has been shown in the preceding section that the glaciated and non-glaciated sections in Ohio differ very markedly, and that this difference is due predominantly to the fact that one part of the state has been glaciated and another not. A marked difference in economic conditions therefore is to be expected. That the differences noted are due wholly to glaciation or lack of glaciation must not be presumed, but that glaciation is the main factor is quite certain.

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[18] Columbus Folio, No. 197, p. 1.

[19] Tight, Prof. Paper, No. 13, U. S. G. S., p. 84.

[20] Andrews, "Geol. of Ohio," Vol. II, Pt. I, p. 457.

The Farm Lands.—The effect of favorable or unfavorable natural conditions—soil, topography, drainage—is reflected most clearly in data relative to farm lands and farm products. In 1910 the non-glaciated section of Ohio had 91.2 per cent. of its land in farms; the glaciated section, 93.0 per cent.[21] In the same year the improved acreage in farms was 73.6 per cent. versus 82.0 per cent. These figures clearly indicate what may be expected of the two sections, agriculturally. Although the percentage of farm lands is nearly the same, the acreage under the plow is distinctly less for the non-glaciated part. The non-glaciated section, therefore, at the very outset is placed under a considerable handicap. It is interesting to note also, that since 1850 this section has not had its proportionate share (26.5 per cent.) of the improved farm lands of the state. In that year it had 24.6 per cent.; in 1860, 24.4 per cent.; in 1870, 25.7 per cent.; in 1880, 26.3 per cent.; in 1890, 25.5 per cent.; in 1900, 25.2 per cent.; in 1910, 24.3 per cent. The slight decrease after 1880 does not mean, necessarily, an abandonment of farm lands, but may mean an increase of improved farm lands for the rest of the state. This improved land may have come through the reclamation of swamps or through the clearing of woodland, both no doubt being factors.

The Improved Farm Lands.—The data on woodlands do not add much light, except that relatively more wooded land is found in the non-glaciated section. In 1870 the non-glaciated section had 30.9 per cent. of the woodland of the state; in 1880, 30.6 per cent.; in 1910, 35.3 per cent.[22] The difference might be due to a variety of causes. The relative proportion of woodland has increased slightly in the non-glaciated section, but not sufficiently to be very significant. Unimproved land other than woodland makes a similar showing for these same years, viz.: 1870, 16.7 per cent.; 1880, 28.5 per cent.; 1910, 30.7 per cent. The proportion of the total unimproved farm lands of the state found in the non-glaciated section was in 1850, 28.0 per cent.; 1860, 29.7 per cent.; 1870, 23.8 per cent.; 1880, 29.5 per cent.; 1890, 31.0 per cent.; 1900, 25.0 per cent.; 1910, 33.0 per cent. Although these figures show in a general way that the non-glaciated section has more than its share of unimproved lands and that this percentage is constantly growing, yet the making of these classifications and the gathering of such data are beset with so many difficulties that the data given "must be considered, at best, only a close approximation."[28] No other explanation than this seems adequate to account for such wide departures from the general trend as is the case above in the unimproved farm lands of the non-glaciated section for the census years 1870 and 1900.

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[21] Unless otherwise noted all data are taken from the U. S. Census Reports. The adding, when advisable, was done by machine, and care was taken to have all figures reliable. To save space and avoid tiresome repetition, the figures for the non-glaciated section precede those for the glaciated, and are recorded thus: 91.2 per cent. versus 93.0 per cent.

[22] Unfortunately, the same classification is not always used in the various census reports. This accounts for the gaps, which it would be very important to fill, were it possible.

The Size of Farms.—The difference in the size of farms between the two sections is quite marked. Of the very large farms, 1,000 acres or more, the non-glaciated section had only 15.2 per cent. of the total in 1860; but it had 37.7 per cent. in 1880; 33.1 per cent. in 1890; 34.4 per cent. in 1900; and the remarkably high figure of 42.9 per cent. in 1910. The 500 to 999 acre farms show a similar trend. The same section in 1860 had 20.4 per cent.; 1880, 37.2 per cent.; 1890, 34.8 per cent.; 1900, 32.7 per cent.; 1910, 36.0 per cent. From these figures it is seen that the non-glaciated section has more large farms, comparatively, than the glaciated. Probably more significant is the general increase in the percentages in the later decades, indicating an actual increase in the number of large farms in the non-glaciated section; or that the large farm in the glaciated section is disappearing. The fact is, the actual number of large farms for both sections has been decreasing since 1880. To-day there are only about half as many farms of more than 500 acres as then. The size of the average farm also has decreased 7.8 per cent. since 1880. The average number of acres per farm since 1880 is as follows:

1910	non-glaciated	96.9 acres,	glaciated	85.7 acres.
1900	non-glaciated	96.8 acres,	glaciated	85.6 acres.
1890	non-glaciated	105.3 acres,	glaciated	88.6 acres.
1880	non-glaciated	116.0 acres,	glaciated	93.0 acres.

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[28] U. S. Census Bull., Agri. of Ohio, 1910, p. 1.

This shows a regular decrease in both sections (except for 1910), but the decrease has been about twice as great in the glaciated section as in the non-glaciated. The slight increase for 1910 may show a transition to larger farms again, due, perhaps, to the highly-specialized types of machinery being introduced by farmers and making possible the cultivation of larger areas.

The difference between the two sections in the value of farm lands is very marked.[24] In 1850 the farm lands of the non-glaciated section represented 20.9 per cent. of the total value of the farm lands of the state; in 1860, 18.7 per cent.; in 1870, 19.5; in 1880, 17.9; in 1890, 17.1; in 1900, 13.7; in 1910, 11.9. The very low comparative value of the lands as far back as 1850 is very striking, especially when one considers the long-delayed development of northwestern Ohio. The constant decrease, until 26.5 per cent. of the area of the state has only 11.9 per cent. of the land value, can be explained only on the basis of great inferiority. The value per acre of farm land for the two sections brings out the contrast very sharply. In 1900 the average value per acre stood $18.55 versus $34.99; in 1910, $23.69 versus $63.83. This extraordinary contrast must be due not only to the difference in the land itself, but to the difference in the whole commercial development of the two sections, for it means that one acre in the glaciated is equal to almost three in the non-glaciated section.

The Value of Farm Buildings and Farm Property.—The character of the farm buildings is usually a fair index of the prosperity of the farmer. On this basis, the farmer in the non-glaciated section makes a rather poor showing. In 1900 the non-glaciated section contributed only 16.0 per cent. of the value of all the farm buildings of the state, and in 1910 only 14.6 per cent. Not only is the value of farm land and farm buildings less than the proportionate 26.5 per cent., but what is more significant, these values in the non-glaciated section are increased much less rapidly than in the rest of the state, so that the difference is becoming greater.

The value of all farm property in the non-glaciated section is also considerably less than it should be. This section in 1870 had 14.7 per cent. of the value of the total farm property; in 1890, 17.7 per cent.; in 1900, 13.7; in 1910, 14.8. From 1900 to 1910 the value of all farm property in the two sections increased 30.9 per cent. versus 68.5. These figures are very striking, and must be considered as a fairly good index of the prosperity of the two sections. However, the more rapid increase in percentage in the glaciated section, more than twice that in the unglaciated, undoubtedly is due

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[24] See Fig. 3.

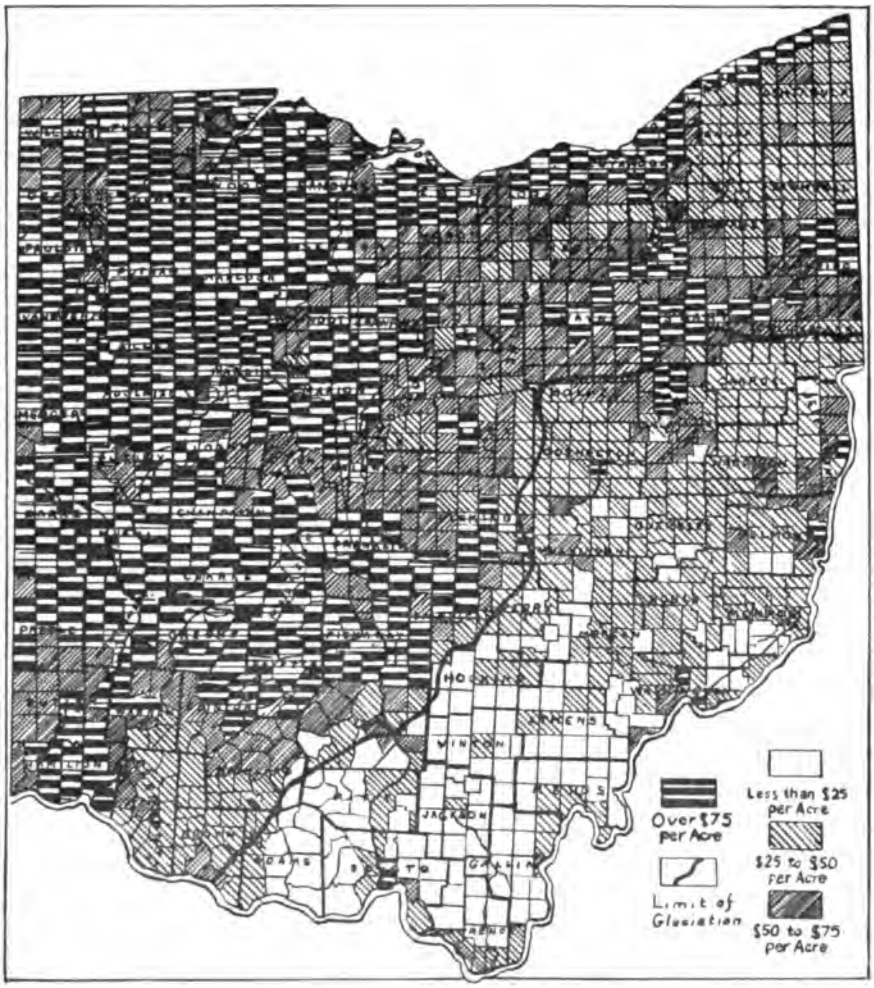

FIG. 3. Map of Ohio, Showing Average Assessed Value of Farm Land, 1911. Adapted from Reconnoissance Soil Survey of Ohio, U. S. Department of Agriculture.

in part to the complex variety of farm machinery which seems necessary to the successful farmer of the present day. This need may not yet be felt so keenly in the non-glaciated area.

Effects on the Farmer and Farm Laborer.—What the effect of the difference in size and value of farms is on the farmer has not been worked out very thoroughly; throughout the state there is a tendency toward a growing tenant class. This seems to be more pronounced in the glaciated section. The following table shows the percentage of farms of the state cultivated by owners.

	Whole State	Non-glaciated Section	Glaciated Section.
1910	70.6	80.1	67.3
1900	71.3	79.0	68.6
1890	77.1	84.6	74.5

Why in the non-glaciated section the rapid decrease occurred from 1890 to 1900 and the slight increase from 1900 to 1910 has not been determined. A slightly different classification in the census-taking possibly may account for such seeming discrepancies.

Not only are there more farmers in the non-glaciated section who cultivate their own farms, but also more farmers who do their own work. At least less is paid out for labor in comparison with the crops produced and land cultivated. In 1900 the farmers of this section expended only 12 per cent. of the total for the state in farm labor, but cultivated approximately 24.2 per cent. of the land. This expenditure is very low, and may be explained, perhaps, on the ground that the farmer's own family does the work. Perhaps the call to the city is less insistent here, and more farmers' sons are willing to remain on the farm.

The value of farm land is determined largely by what the farmer with a reasonable amount of labor can make out of it. With the average land value per acre of $23.69 versus $63.83, there must be a notable difference in profits to maintain this price. The differences in the yields of the chief agricultural products bear this out. Because of their supreme importance in this discussion, a rather extended table[25] is presented in this connection, showing the average yield of these products for a series of years.

Crop Yields and Their Significance.—The table is self explanatory. The very striking thing is that not in a single product, for

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[25] See Table I.

TABLE I.

Average yield per acre in bushels.				Yield in glaciated greater than non-glaciated. Percentages.	Non-glaciated percentages of total.	
Year.	State.	Non-glaciated.	Glaciated.		Acreage.	Crop.
			Wheat.			
1910	16.8	14.7	17.5	19.0	16.9	14.5
1900	16.8	11.4	18.4	61.0	17.1	12.5
1890	15.1	13.5	15.7	16.0	15.9	13.8
1880	18.0	13.2	19.7	49.0	19.5	14.4
			Corn.			
1910	40.2	34.3	42.0	22.0	16.2	13.8
1900	41.4	30.7	45.2	47.0	15.7	12.2
1890	35.7	33.2	36.6	10.0	16.1	14.9
1880	34.1	29.1	35.9	23.0	17.9	15.3
			Oats.			
1910	32.2	24.7	34.7	40.0	15.4	11.5
1900	37.8	29.7	40.7	37.0	9.5	7.5
1890	33.0	24.9	35.9	44.0	15.4	11.5
1880	31.5	21.5	35.0	63.0	19.0	12.9
			Barley.			
1910	26.1	19.1	28.6	50.0	1.8	0.9
1900	30.9	17.8	35.5	99.0	1.0	0.6
			Rye.			
1910	13.5	11.8	14.1	20.0	6.9	6.0
1900	14.6	10.5	16.1	53.0	8.4	6.1
			Average yield per acre in tons.			
			Hay, cultivated grasses.			
1910	1.28	1.05	1.36	29.0	23.5	19.3
			Hay, clover.			
1900	1.25	1.13	1.29	14.1	12.7	11.5
			Hay, all kinds, wild hay included.			
1890	1.33	1.21	1.37	13.0	24.9	22.6

any decade given, has the non-glaciated section equaled the rest of the state in yield of bushels or tons per acre, or contributed its 26.5 per cent. of the aggregate acreage or crop. The difference in every case is sufficiently large also so that there can be no question as to the general interpretation of results. That this difference is due entirely to glaciation is not maintained, but that the contrast is too marked to be explained on other grounds alone seems an inevitable conclusion. Another point worth noting is that an off-year for one section may mean a bumper crop for the other. There does not seem to be any relation in increase or decrease between the two sections, except in the case of oats, where a general increase or decrease is about the same for both. It should not be overlooked that the average production for the state is lowered considerably by the poorer yields in the non-glaciated section. The most striking illustration of this is the yield of barley for 1900. With an average for the state of 30.9 bushels per acre, the non-glaciated section produced only 17.8 bushels, while the rest of the state produced 35.5 bushels. The very low yield in the non-glaciated section lowered the state average nearly five bushels per acre.

What the greater yields of the glaciated section mean to the farmer and to the state may be seen in the fifth column of the table, which shows differences in yield by percentages. It appears that the average yield per acre in the glaciated region is from 10 to 99 per cent. greater than in the non-glaciated section. This means that for every 100 bushels produced by the farmer in the non-glaciated section, the farmer in the glaciated country, from the same acreage, produces 10 to 99 bushels more. Thus from like acreages in 1900, for every 100 bushels of barley raised in non-glaciated Ohio, 199 bushels were raised in the rest of the state.

However, the difference in yield per acre by no means represents the full difference between the two sections. It is well to note also (1) that other things being equal, it costs a farmer just as much to prepare a seed bed and plant the seed, and usually as much to care for the growing crop and then to harvest it, whether the yield be large or small; and (2) that the amount of money invested in necessary equipment is about the same whether he raises 14.7 or 17.5 bushels of wheat per acre, as the average farmer of the two sections did in 1910. Furthermore, the larger the yield the better the quality of grain in most cases, and the higher the price it commands. The average farmer frequently works on such a narrow margin that the difference between the successful and the unsuccessful farmer may be in the fact that one is able to raise an extra bushel or two of grain per acre each successive year. In other words, a certain number of bushels per acre are necessary to meet the expense of growing and marketing the crop. Whatever is profit must come from the rest of the crop. If at current prices it is necessary to grow 12 bushels of wheat per acre to meet expenses, then it is quite evident that the farmer raising 17.5 bushels will make more than twice as much as the farmer raising only 14.7 bushels. If, on the other hand, it takes 15 bushels of wheat per acre to meet expenses, then one man fails while the other succeeds.

The Comparative Acreage and Crops.—Not only is the yield per acre much less in the non-glaciated section, but the comparative acreage devoted to crops is distinctly less. Since the non-glaciated section represents 26.5 per cent. and the glaciated section 73.5 per cent. of the total acreage, it is reasonable to expect, if agricultural conditions are equally good, that the acreage devoted to crops be of this order in each section. The table on page —, however, shows this not to be the case. The non-glaciated section falls consistently below its proportionate acreage for all the crops in all the years given, and the glaciated section, of course, rises correspondingly above. The nearest approach to a normal acreage in the non-glaciated section is in hay; but clover, so important to the farmer in keeping up the fertility of his land, is abnormally low.

The last column of the table, giving the crop percentages of the non-glaciated section, shows what a small part of the agricultural wealth of the state this section produces. One fourth of the area grows scarcely one eighth of the crops. Taken in connection with the preceding column, these figures show also that in no case is the crop as large as might be expected from the acreage. The same thing is true of orchard products, in which this section of the state might be expected to take high rank, since the natural conditions would seem to favor fruit growing. The occasional late spring frosts are a great handicap to the fruit industry throughout the greater part of the state. The non-glaciated section has something of an advantage in latitude, besides frost drainage in hill countries is usually quite effective.[26] Nevertheless, the orchard products of this section are considerably below normal, in bushels being only 21.2 per cent. of the total for the state. The comparatively frost-free region along the lake with its numerous vineyards and orchards may account for this relatively low percentage.

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[26] Bull. 235, Ohio Expt. Sta., pp. 198–202.

The Live Stock.—A study of the live stock industry shows a similar situation. Horses, swine, and cattle all fall below the normal in the unglaciated section. Sheep, considered the least profitable of farm animals under average conditions, are a notable exception to the rule. In 1910, measured in money value, this part of the state had 32.4 per cent. of the sheep; 18.4 of the cattle; 15.5 of the horses; and 9.8 of the swine. The following table presents the data available on live stock for the decades since 1850.

TABLE II.

Non-glaciated Ohio, percentage of total

Year.	Live stock, value.	Sheep, number.	Swine, number.
1910	17.8	32.9	10.5
1900	19.8	34.5	11.8
1890	20.5	45.8	14.0
1880	21.2	37.4	14.4
1870	22.7	35.8	20.2
1860	21.3	30.0	19.7
1850	21.8	26.9	23.1

The first column in Table II presents the relative value of live stock since 1850. Although the value during this time has never been up to the normal (26.5), the showing is better than in the strictly agricultural products. A general decrease in the percentages is to be noted, however, especially since 1870. Here as elsewhere the decline is not in actual numbers or value, but relative to the rest of the state. It is due, therefore, to the greater development in the glaciated section. Because sheep and swine are somewhat contrasted in their relation to the soil, the data of each are presented for comparison in the second and third column. The rapid decline in the relative number of swine is rather extraordinary. Although the non-glaciated section produces 13.8 per cent. of the corn, it produces only 10.5 of the swine by number and 9.8 by value. This would seem to indicate also that the hogs were of a lower grade. The rapid increase in the number of sheep in the earlier years and then the rapid decline since 1890 may be explained readily by tariff legislation. The contrast with swine between the number and value of sheep in 1910 is less marked. The difference between 32.9 per cent. for the former and 32.4 per cent. for the latter is not sufficiently large to be significant.

The Distribution of the Population.—The character and productivity of the farm lands play a very important part in the distribution of the population of the state. The number of people in the non-glaciated section is very small, relatively. Even as early as 1850, when much of northwestern Ohio was considered still a wilderness, it had only 25.0 per cent. of the population of the state. With each succeeding decade the proportion has been smaller. In 1860 it had 23.6 per cent.; in 1870, 22.0; in 1880, 20.9; in 1890, 19.2; in 1900, 18.0; in 1910, 16.8. The relatively poor showing of the earlier years is especially interesting since this section borders the upper Ohio, in early days one of the important routes into the interior. This is emphasized by the fact that the first permanent white settlement within the limits of the state (Marietta, 1788) was made on the Ohio in the non-glaciated section. Moreover, as already noted, the development of northwestern Ohio was long delayed because of the poor drainage conditions of "the Great Black Swamp" region.

The relative decline in the population of the non-glaciated section has been very rapid. While in 1850 the section contained nearly its proportionate share of people, it contained in 1910 only 16.8 per cent. of the population of the state, less than two thirds the percentage it should have had. Of course, the decrease was only relative, due to the much more rapid growth of population in the glaciated section. The actual increase in population from 1900 to 1910 was 3.0 per cent. versus 18.8 per cent.; from 1890 to 1900, 6.4 per cent. versus 15.6 per cent. Although there has been an increase in both the non-glaciated and glaciated sections, the rate of increase since 1890 in the former has been declining, while that in the latter has been increasing. In the last two decades, at least, the contrasts in population have been increasing constantly, until in 1910 the density of population per square mile was 71.9 versus 133.0. This gives the non-glaciated section a density about equal to that of Indiana (74.9) and the glaciated area a density about that of Maryland (130.3).

The Rural Population.—Although the difference in density of population is large, the density of the rural population of the two sections is about the same, with little change during the last decade. In 1910 the rural[27] population per square mile was 51.2 versus 51.7, with a decrease during the decade 1900 to 1910 of 1.2 per cent. versus 1.3 per cent. This general distribution of rural population is rather remarkable, especially in the light of the agricultural productions of the two sections. Similarly, the greater recent decrease in the glaciated section is difficult to explain when one considers the greater tendency toward smaller farms in this section. The difference, however, is very small, and perhaps merits attention only in a more detailed study.

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[27] All places of less than 2,500 population are considered rural.

The Distribution of Cities.—The greater density of aggregate population in the glaciated section is due largely to the presence there of more and larger cities. In 1910 Ohio had eight cities with a population of more than 50,000 and all of them were in the glaciated section. These eight cities have a total population of 1,589,189, or nearly a third (33.1 per cent.) of that of the entire state. Of the twenty-nine cities having a population of 10,000 to 50,000, eight are in the non-glaciated section and twenty-one in the glaciated area. The cities of this size, therefore, predominate slightly (27.6 per cent.) in relative number in the non-glaciated section; but the eight contain only 21.6 per cent. of the total population of the group. It will be recalled that the non-glaciated section has only 16.8 per cent. of the total population.

The growth of cities, in contrast with the state-wide decrease in rural population, is phenomenal. The eight cities of more than 50,000 each increased 73.5 per cent. in the last census decade. The increase in cities with 10,000 to 50,000 population in the two sections was 79.9 per cent. versus 73.0 per cent. This seems to show a remarkable increase in population in the cities of the non-glaciated section. Since they represent 27.6 per cent. of the number and only 21.6 per cent. of the population, it is evident that they are smaller and that a similar increase in number will produce greater percentages. Similarly, the large cities increased vastly more in numbers than the smaller ones, although the percentage increase is about the same. The data at hand do not permit the drawing of sweeping conclusions; but the remarkable growth of the very large cities in the glaciated region indicates clearly its industrial and commercial advantages. Of course, as stated before in other connections, the dominance is not to be attributed wholly to glaciation.

The Manufactured Products.—The manufactured products of the non-glaciated section form a rather insignificant part of the total for the state. The eight cities of more than 10,000 each in 1900 produced 13.1 per cent. by value, and in 1910, 6.3 per cent. of the total. However, compared with the other twenty-one cities between 10,000 and 50,000 in the glaciated section, they make an excellent showing. Their product in 1900 was 48.3 per cent. and in 1910, 36.5 per cent. of the total for the twenty-nine cities. The small cities in the non-glaciated area, therefore, outrank those of the glaciated section. It is to be noted, however, that in relation to the whole state the amount of manufacturing is very low, and that this section is rapidly losing the standing it has had. In 1900 the non-glaciated section, roughly one fourth of the state, produced one eighth of the manufactured products, and in 1910 only about one sixteenth.

The Influence on Population.—So many factors may enter to influence the distribution and character of the population that few generalizations can be made without a more intensive study. However, some very suggestive things may be noted. In 1910 the illiteracy of persons of ten years of age or older was 4.6 per cent. versus 3.5 per cent. The contrast is even greater if the foreign and negro element is excluded. In 1910 the illiteracy of the native-born white population of ten years of age or more was 3.7 per cent. versus 0.8 per cent. Since with few exceptions the negro and the foreigner are found in the cities, it is evident that the illiteracy in the glaciated section is almost wholly a city problem, and that the rural districts are nearly free from illiterates. In the non-glaciated section, however, the 3.7 per cent. illiteracy of the native whites undoubtedly relates to both rural and urban communities. This is significant, for it very probably is the result of the physical features and natural resources of the area. In comparison with the area, the illiteracy of the native-born whites in the non-glaciated section was 43.1 per cent. of the total for the state in 1900, and 39.9 in 1910. This means that in 1910 26.5 per cent. of the area had 39.9 per cent. of the illiterate native whites, and 73.5 per cent. of the area had only 60.1 per cent. It should be noted that the non-glaciated section produces nearly all the coal mined in the state. This undoubtedly accounts for a considerable part of the illiteracy among native-born whites in this section. It may not be irrelevant to add that Adams County, of vote-selling fame, is an unglaciated county.

The following figures, more interesting than conclusive, may be indicative of another characteristic. In 1880 the non-glaciated section had 65.3 per cent. of the working oxen of the state, and in 1890 it had 75.4 per cent. Later data on this subject are not available. In 1912 this same section had only 7.7 per cent. of the gasoline automobiles of the state, and only 1.2 per cent. of the electrics.[28] When it is kept in mind that the "measuring stick" is 26.5, these figures become significant. It shows, at least, that this section is the last to discard the old as well as the last to adopt the new.

For ready comparison, part of the data already presented is here put into chart form. It includes the data that were readily available for the decades between 1850 and 1910, inclusive. The abscissas are the years from 1850 to 1910, and the ordinates are the percentages from 0 to 100. The upper part of the chart, in percentages of the total, gives the data for the glaciated section; the lower similarly gives the percentages for the non-glaciated. Curves are plotted showing (1) the population, (2) the improved farm lands, (3) the value of the land in farms, (4) the number of sheep on farms, (5) the number of swine on farms, and (6) the value of all live stock on farms. There are two base lines for comparison, one at 26.5, the other at 73.5, the proportionate area of land represented in the non-glaciated and glaciated sections respectively. The data being presented in percentages, the curves for both sections deviate equally from their respective base lines and in opposite directions, and thus become mirror images of each other. The base lines representing areas show where the several curves would be were the two sections equal in every respect. The chart shows, therefore, (1) the percentages of the various items plotted, (2) how much more or less than its proportionate share each section has had in the decades given, (3) how regular or irregular the increase or decrease has been, and (4) what the probable tendency may be in the future.

The regularity or irregularity of curves is quite significant. Geographic influences act steadily and should produce, therefore, curves of considerable regularity. The irregularity in the curves presented is due very possibly either to inaccurate data or to influential non-geographic factors. The curve for swine probably represents the former condition; the curve for sheep represents the latter condition, and is the result largely of tariff legislation. All the other curves are fairly regular for all the years except 1870.

[28] *Cleveland Motorist*, April, 1913. p. 21.

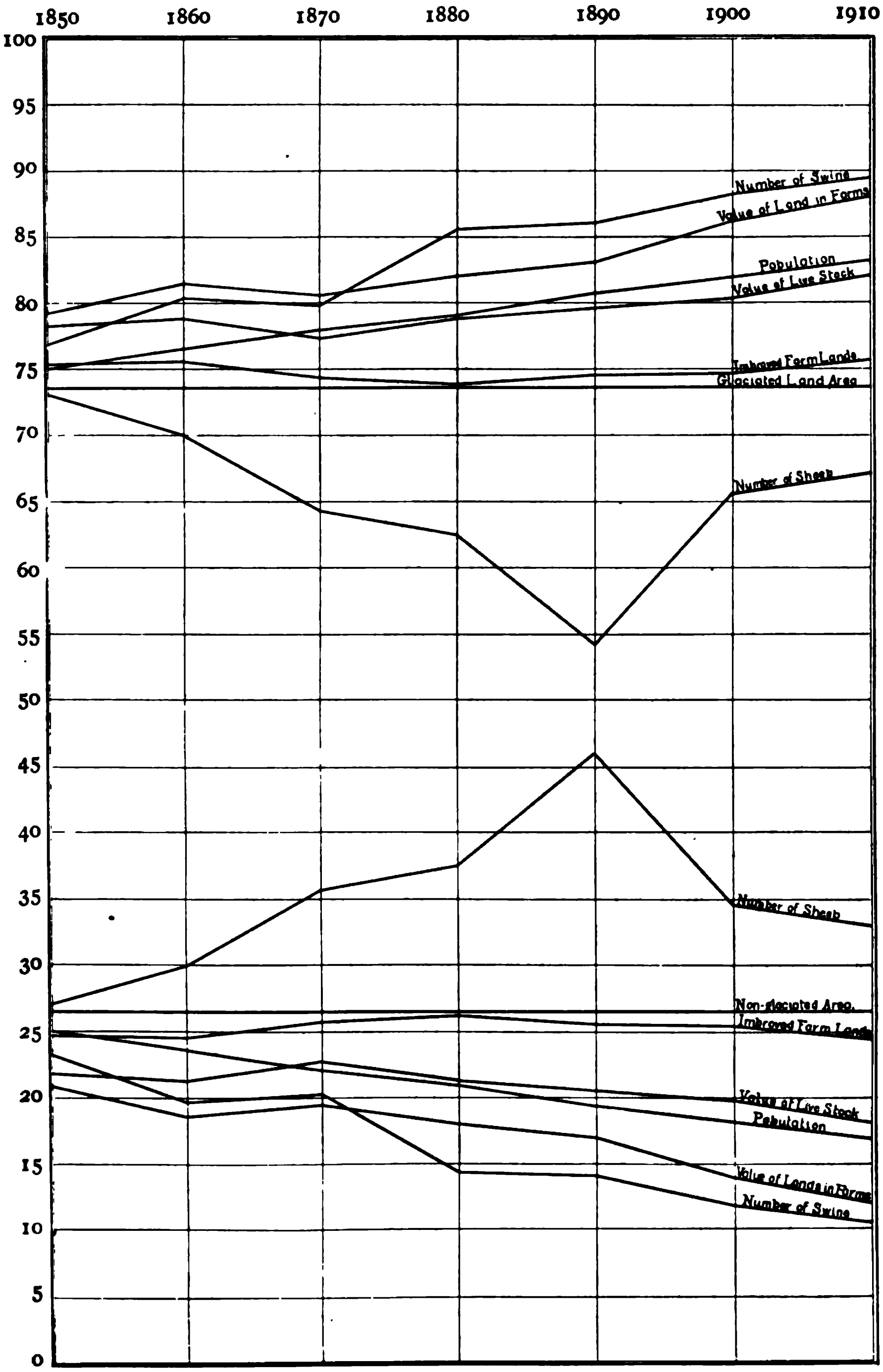

FIG. 4. Changes in Glaciated and Non-glaciated Ohio, 1850–1910. (For explanation see text, p. 39.)

This probably was the result of the civil war, and, interestingly enough, the glaciated section seems to have suffered most.

The regularity of some of the curves is indeed remarkable, when the length of time involved is considered. The curves also emphasize the great superiority of the glaciated section over the non-glaciated, whatever the extent of difference due to glaciation. Nor has the contrast, seemingly, yet reached its climax, for thus far there has been a constantly increasing divergence from the normal. The curve for swine presents the greatest variation, dropping for the non-glaciated section from 23.1 per cent. in 1850 to only 10.5 in 1910. The curve showing the population has the greatest regularity, making almost a straight line. The curve for the value of the land in farms, although not so regular, nevertheless is perhaps the most valuable in showing the relative economic importance of the two sections.

General Conclusions.—Having in mind the great contrasts between non-glaciated and glaciated Ohio, (1) in the percentages of the improved farm lands, (2) in their value, (3) in the products of these lands, (4) in the kind and amount of live stock, and (5) in the population and industrial activities, no one can fail to recognize the great superiority of the glaciated region. That these contrasts are the results of differences in physical conditions brought about chiefly through glaciation also may be considered as certain.

It is not maintained that every contrast noted above is due entirely to glaciation. The density of population, the number and size of cities, and the value of manufactured products are abnormally out of proportion to the relative sizes of these two areas. Other than glacial factors no doubt enter into the problem and modify results. The development of many of the larger cities in northern Ohio has been greatly enhanced by their situation along the main trunk lines between New York and Chicago. The lake itself is an influential factor, especially in connection with the iron industry. The problem is further complicated by the fact that the lake exists because of glaciation, and that the trunk lines are where they are because of the flattish areas in northern Ohio, and because of the Hudson-Mohawk depression, due to or modified by glaciation. To evaluate properly such factors a much more intensive study is needed.

Neither have all the factors that have had an important part in the development of the state been treated fully or even touched upon. Many factors have been neglected entirely because of their slight connection with glaciation or because of the difficulty of evaluating their influence. Coal-mining, confined almost wholly to the non-glaciated section, would have been much more difficult had the whole state been glaciated; as it is, the industry has been of great importance to this section in numerous ways. The salt industry[29] and its influence in southeastern Ohio is a study in itself. Many of the better clays of the state are associated with the coal beds; and the clay industry has had no mean part in the development of a number of the cities of this section.[30] Neither has the influence of oil and gas been taken into consideration, both of which have been important factors in adding to the wealth of certain sections of the state. The iron industry should not be neglected in its direct and indirect influences. The influence of topography on canal and railroad building also has been great. These and a host of other problems need special treatment to evaluate their influence correctly and to correlate them properly with the question of the effects of glaciation. Notwithstanding these limitations, the margin of difference between the two sections is too great for one to reach any other conclusion than that glaciation has added immensely to the wealth of Ohio.

[29] Bownocker, Geol. Surv. of Ohio, Bull. 8, Fourth Series.

[30] Bownocker, *Jour. of Geol.*, Vol. IX, p. 179, 1911.

THE TWENTY-FIFTH ANNIVERSARY.

On Wednesday evening, December 6, the members of the Society were the guests of the President and the Board of Directors, and of the Academy of Natural Sciences, at exercises formally commemorative of the Society's completion of twenty-five years of varied activity in the study of geographic science and the encouragement of exploration. These exercises, attended by a large audience, were held at the Academy of Natural Sciences. The speakers were Dr. Samuel G. Dixon, President of the Academy, who delivered the address of welcome; President Henry G. Bryant, who presented a historical review, "Men and Memories of the Early Days of the Society"; Doctor Talcott Williams, director of the School of Journalism, Columbia University, on "The Past and the Future of the Society," and Rear-Admiral Robert E. Peary. Congratulatory messages were received from a number of distinguished explorers and from the American Geographical Society, the National Geographic Society, and the Peary Arctic Club. Following the formal exercises in the Auditorium, a reception was held in the Library Hall of the Academy.

REMARKS BY DR. SAMUEL G. DIXON.

In welcoming the Geographical Society, Dr. Samuel G. Dixon, President of the Philadelphia Academy of Natural Sciences, spoke of some of the early geographic work of the Academy. He said, in part:

There is no department of the Academy that is not of interest and importance to the geographer. Of course, the unscientific explorer of unknown regions may place additional details of the surface of the earth on the maps and thus complicate the problems confronting the youthful users of school geographies, but in the absence of a knowledge of geology, meteorology, anthropology and the characteristics of fauna and flora, his efficiency is seriously discounted and the results of his labor of relatively small value.

The Academy throughout its history has been conscious of this and through individual members and as a body, has rendered important encouragement to geographical research. It is of interest to note that the first recorded activity of your mother institution, a few weeks after its inauguration, was in a very small way geographical, when the members made an excursion in carriages to the mines of the Perkiomen. In 1818 Thomas Say, to whose zeal and devotion the continued existence of the infant society is probably due, with two other members, visited the coast of Georgia and the adjacent islands, proceeding eastward to Florida, then under the dominion of Spain. In the following year, Say and Titian R. Peale were members as zoölogist and assistant zoölogist respectively of Major Long's expedition to the Rocky Mountains.

Without going into the details of the travels of individual members of the Academy, it may be noted that indirect assistance was given the earlier geological and geographic surveys by the publication of their results in the Academy's *Proceedings*, together with those of Page and Mickler's expeditions to South America, Roger's voyages in the Pacific, the work of the Northwest Boundary Commission in Puget Sound and some of those of the Survey of the Pacific Railroad Route. In truth, extending well into the nineteenth century there were no avenues for the publication of such results except the *Proceedings* and *Journal* of the Academy.

In 1852 Elisha Kent Kane received practical assistance on the occasion of his expedition in search of Sir John Franklin. The fate of the expedition being for a time in doubt, Congress was memorialized to extend the earliest possible relief. In 1859 the Academy endorsed the expedition of Lieutenant J. M. Gillis to South America for the determination of the true solar parallax. The year before a committee was appointed to coöperate with Dr. Isaac T. Hayes in furthering the interests of his proposed Arctic expedition. The possible existence of the open polar sea was the matter of dominant interest with Dr. Hayes. On his return in 1861, in recognition of the encouragement and assistance extended by the Academy, Dr. Hayes addressed a meeting on November 26 and gave the details of his work. He placed at the disposal of the Academy a selection from a large number of specimens of natural history brought back by him.

The details of Lieutenant Robert E. Peary's connection with the Academy are probably known to all the members of the Geographical Society of Philadelphia. After preliminary experience in Greenland, which established confidence in his ability as an Arctic explorer, an expedition was fitted out by the Academy on which Lieutenant Peary, as commander, was associated with Benjamin Sharp, William H. Burk, William E. Hughes, Jacob Farnum Holt as representatives of the Academy under the immediate leadership of Professor Angelo Heilprin. Peary's immediate party was left during the winter on the shore of MacCormack Bay. A relief expedition, under charge of Professor Heilprin, started from Brooklyn the following June. Of this enterprise your president, Henry G. Bryant, was second in command. The party reached Philadelphia in September, having, with almost dramatic promptness and exactness, accomplished the work of its mission.

Now that you have had a touch of the geographical work of your mother institution, I will leave you to Mr. Bryant, your able president, that you may be reminded of your youthful days.

MEN AND MEMORIES OF THE EARLY DAYS OF THE SOCIETY.

President Henry G. Bryant.

When the question of celebrating the twenty-fifth anniversary of the founding of our Society was discussed, it seemed most fitting that the commemorative exercises should be held at the Academy of Natural Sciences, where the Society had its birth, where its early meetings were held and whose enterprising members furnished its first quota of officers and subscribers. The request for coöperation on behalf of the Academy was cordially granted by the president, and Dr. Dixon has shown that this was no perfunctory act of hospitality by the gracious words of welcome which he has spoken to-night. The Geographical Society is proud of its origin, and, as a daughter of this venerable institution, it presents it's respectful greetings, and, as becomes a dutiful daughter, is grateful for the hospitality so generously extended.

It was inevitable that in time an organization to encourage scientific travel and geographic research should be established in a city which had sent out John Bartram, Captain Swaine, Dr. Kane and Admiral Melville on their journeys of exploration. The time was ripe, therefore, when Angelo Heilprin, in the spring of 1891, called together a few congenial spirits who discussed the formation of such an organization. From a scrap book containing memorabilia of the early days, and from a statement prepared by Professor Heilprin, I quote the following: "The inception of the Geographical Club of Philadelphia is found in a call for organization of such association, bearing date of March 10, 1891.

"A preliminary meeting of organization was held in the Academy of Natural Sciences on March 19. It was then recommended that a Constitution and By-Laws be drafted for presentation at the next meeting.

"On the 30th of the same month, in the Hall of the Academy of Natural Sciences, on Logan Square, a preliminary meeting for the purpose of framing articles of association was held, and the following gentlemen, who had responded to the call, were present: Dr. J. T. Rothrock, Mr. Edward H. Weil, Mr. Simon A. Stern, Mr. Roberts LeBoutillier, Dr. Samuel G. Dixon, Mr. Benjamin Smith Lyman, Dr. Henry Skinner, Prof. Angelo Heilprin and Dr. Benjamin Sharp.

"At this meeting Professor Heilprin was asked to take the chair, and Dr. Sharp acted as secretary. Provisional articles of association were submitted.

"At a meeting held on April 20, in the Hall of the Academy of Natural Sciences, the articles of association framed at the last meeting were formally adopted, and Prof. Angelo Heilprin was elected president of the Club."

Most of those present at the former meetings participated in this gathering and others present included: Dr. Edward J. Nolan, Mr. Edmund Sterling, Mrs. S. C. F. Hallowell, Miss Jean Frazley Hallowell, Mr. and Mrs. Coleman Sellers, Jr., Dr. Henry C. McCook, Dr. D. G. Brinton, Mr. Wm. Righter Fisher, Dr. Charles L. Mitchell, Miss Frances May Bockius and Miss Bessie G. Bockius. Again quoting from Professor Heilprin's memorandum, we read that:

"The broad purposes of the organization rapidly attracted to it the interest of the community, and before the close of November, 1891, 104 names had already been enrolled for membership. The first stated meeting of the Club was held in the new lecture hall of the Academy of Natural Sciences on February 24, 1892, when the president read an opening address on 'The Present Aspects of Geographical Study.' Other addresses were delivered by Vice-President Edward H. Weil and by Dr. D. G. Brinton." The speaker was among the seventy members present at this meeting and vividly recalls the impression made by Dr. Brinton's scholarly address "On the Relations of Earth to Man."

"At the meeting held in May, 1893, the Club's incorporation was announced, and the charter was displayed. The directors of the corporation appear on the charter as: President, Prof. Angelo Heilprin; Vice-Presidents, Mr. Edward H. Weil, Dr. E. H. Williams; Recording Secretary, Mr. Henry G. Bryant; Corresponding Secretary, Mrs. Mary Wager Fisher; Treasurer, Mr. F. Lynwood Garrison; Board of Directors, Mrs. Sarah C. F. Hallowell, Mr. Edwin Swift Balch, Mrs. Anna Williams Dreer, Dr. Daniel G. Brinton, Mr. Coleman Sellers, Jr., Miss Mary Blakiston, Mr. Albert B. Weimer.

"The names of other incorporators on the charter are: Mr. George Glyas Mercer, Miss Martha Bunting, Miss Frances May Bockius, Mr. Gavin W. Hart, Mr. Benjamin Smith Lyman, Mr. Thomas Meehan, Dr. Edward J. Nolan, Civil Engineer Robert E. Peary, Dr. Benjamin Sharp and Dr. Henry Skinner."

As I recall those stirring days of the spring of 1891, there seemed to be in Philadelphia an awakening of the spirit of adventure and scientific exploration. This revival was coincident with the founding of the Geographical Club and our vigorous organization undoubtedly had its influence in fostering a spirit of pioneer investigation. The newspapers devoted space to the details of Peary's approaching expedition to Greenland—the first of his memorable journeys to the far North. The Academy of Natural Sciences, under whose auspices he was about to sail, gave a reception to the young lieutenant and his wife, which was largely attended. As I shook hands with the explorer on that occasion, and reminded him that I also was starting north in a few weeks on a more modest quest than his—to endeavor to reach the Grand Falls of Labrador—he expressed a warm interest in my undertaking and offered to aid me in any way in his power. The following year, the old Newfoundland sealer *Kite* sailed north for the relief of the explorer, with a number of "gentlemen adventurers" on board, eager to visit this rare corner of the world and to aid the gallant Peary in returning from his hazardous journey. The incident of this Arctic journey which most impressed me was our unexpected and dramatic meeting with Peary on the inland ice of Greenland, just as he was completing the last lap of his 1,300-mile sledge journey from Whale Sound to Independence Bay and return.

Peary's success on this first journey aroused interest in the unsolved problems of the North and the explorer was eager to return to his chosen field of effort. He turned to his friend, Heilprin, and to our young organization to aid him in this connection. It will always be a creditable chapter in our history that, by generous contributions of funds, we aided the explorer in going north in 1893 and sent out a well-equipped expedition, which was successful, the following year, in bringing back Mrs. Peary and all the members of her husband's party who elected to return home.

At the time of which I am speaking, and for some years after, the Club had no home of its own and the meetings of the directors were held in different private houses. In the month of February, 1896, our finances seemed to warrant the hiring of a room in the Haseltine Building, and to these headquarters were transferred all our books and exchanges and our charter. A few days later the building was entirely destroyed by fire and the Club lost all its possessions. We then secured a room in the Baker Building at 1520 Chestnut Street, where we remained until we took possession of our present quarters in the Witherspoon Building.

A roving, democratic spirit characterized the selection of our meeting places for many years. On February 5, 1896, we held our last meeting in the Academy of Natural Sciences, when we passed resolutions thanking the Academy for past hospitality extended. Subsequent meetings have been held and lectures delivered at: The New Century Drawing Room, The Pennsylvania Academy of the Fine Arts, Horticultural Hall, the New Odd Fellows Temple, the Drexel Institute and the Griffith Hall of the Crozer Building. We first used Witherspoon Hall in January, 1901, when Dr. A. Donaldson Smith reported to us the results of his African explorations; and since April, 1903, all our large meetings have been held in this auditorium. On December 2, 1896, the Club voted to change its name to Society and this change was approved by the Court in April, 1897.

In October, 1897, the famous Norwegian explorer, Dr. Nansen, lectured at the Academy of Music and, following his address, our Society gave him a reception in Horticultural Hall. Dr. Nansen was indirectly responsible for the drift cask experiment carried out by the Society. At the Nansen meeting of the American Philosophical Society, held at this time, Commodore George W. Melville suggested a plan for securing data relating to circumpolar currents, by placing numbered drift casks adrift on the Arctic floes north of Behring Strait. An editorial in *The Press* called attention to the potential results to be obtained from a trying out of this scheme. The plan was subsequently executed by a member of the Society and the final outcome, including the recovery of two casks in the North Atlantic after voyages lasting for over four years, during which they presumably drifted across the North polar area, attracted wide attention.

The first award of the Elisha Kent Kane medal of the Society was made on November 6, 1901, to Dr. A. Donaldson Smith, of this city, in recognition of his explorations to the east of the upper Nile. In the following years, this medal has been awarded to the following explorers and students of geography:

Rear-Admiral Robert E. Peary, U.S.N., also recipient of a special Gold Medal for his discovery of the North Pole; Professor Angelo Heilprin; Captain Robert F. Scott, R.N.; Professor William B. Scott; Captain Roald Amundsen; Dr. Sven Hedin; Sir Ernest H. Shackleton; Rear-Admiral George W. Melville, U.S.N.; Professor William Morris Davis; and Dr. Ellsworth Huntington.

As red letter events in the history of the Society, mention must be made of a series of eminently successful lectures given under our auspices at the Academy of Music. The first of these was the North Pole lecture of Peary in December, 1909. Then followed the "Farthest South" lecture by Sir Ernest Shackleton in April, 1910, and the memorable Amundsen lecture in January, 1913, when the "three polar stars," Peary, Amundsen and Shackleton, shone from the firmament at the same time. Fully equal to these from a popular standpoint was the address given by Colonel Roosevelt in April, 1915, on his explorations in the Brazilian wilderness.

In its quarter century of existence, the affairs of the Society have been administered by seven presidents: Angelo Heilprin, Edwin Swift Balch, Henry G. Bryant, Amos Bonsall, Emory R. Johnson, Alba B. Johnson and William E. Lingelbach.

All these executives (and I especially voice my own sentiments in this connection) have profited by the loyal support of officials who have lightened the cares of office and shown unfaltering interest in the success of the Society. Time will not permit me to dwell on the goodly number of these friends of our organization who have given freely of their time and enthusiasm, but I venture to name three veteran staff officers who have always been ready to work for the Society: On examining the records, I find Dr. Paul J. Sartain has been a secretary of the Society from its inception to date, with the exception of a few months during the first year of our existence. Likewise Miss Mary S. Holmes has been the untiring and resourceful chairman of our Excursion Committee for a like period, although for one brief season I believe another posed as chairman of that Committee. While Dr. Sartain specialized as Corresponding Secretary, the honors and the burdens of Recording Secretary were borne during a long term of years by Mr. Frank B. Greene and Dr. Theodore Le Boutillier respectively.

In these remarks I have touched in a most cursory manner on some of the men and events which have gone to make up the history of our Society in the twenty-five years of its existence. In recalling these delightful memories of the past, we are proud of what has been accomplished, by a maximum of personal service on the part of a few, and a minimum of salaried expenditure in administering the affairs of our organization. We are not unmindful of the fact that the zeal and disinterestedness of the governing body of the Society could not have won success had we not had the support and approval of our membership, who, amid the complex conditions and demands of modern city life, retain their membership and fix the character and assure the success of our meetings by their presence.

With all our background of creditable achievement, the truth is borne home to us at times that the Society has not fully lived up to the ideals of an efficient geographical organization as defined in our charter. This disability to occupy the commanding place among the city's educational institutions to which it is entitled arises solely from lack of resources. I venture to hope that before another quarter century passes, the Geographical Society of Philadelphia will possess an adequate endowment and be in a position to fulfil its destiny as one of the greatest institutions of its kind in the country.

REMARKS BY DOCTOR TALCOTT WILLIAMS.

In Doctor Williams's address on the "Past and Future of the Society," mention was made of the determining rôle played by members of the Geographical Society in having the Panama Canal route chosen over the Nicaragua route. According to Dr. Williams, the Nicaragua route, which had been favored by the Canal Commission, was in great favor in Washington and was apparently to be ratified. Angelo Heilprin, the founder and then president of the Philadelphia Geographical Society, had made a detailed study of the Nicaragua region, and his address before the Geographical Society, afterward published, attracted so much attention that Prof. Heilprin was summoned to Washington to meet government officials. As a result of his testimony, these officials were converted to his opinion and the Nicaragua Route was abandoned in favor of the Panama Route.

REMARKS BY REAR-ADMIRAL PEARY.

At the close of the formal exercises, Rear-Admiral Peary was called upon and responded in a short address in which he paid a glowing tribute to the aid he had received in his Arctic explorations from the Society and the Academy. "Philadelphia," he said, "is the generous mother of Polar exploration. In fact, to her may be traced the honor of finally having the American flag placed at the North Pole. I remember well what warm and unceasing aid was given to me when I first left on the Greenland expedition. Not only did this Society and the Academy of Natural Sciences place their facilities at my command, but they generously gave financial and other aid that was absolutely essential. To this support, unceasing and unswerving, must be attributed the ultimate triumph in Polar discovery."

Referring to Dr. Williams's remarks in regard to the Society's influence in the Panama-Nicaragua Canal controversy, Admiral Peary predicted the construction of a second inter-oceanic canal by the Nicaragua route within the next quarter century.

GEOGRAPHIC NEWS AND NOTES.

Geography at the University of Pennsylvania.—The variety of courses in geography offered at the University and the number of students taking geographic courses may be a matter of some surprise as well as interest to members of the Geographical Society. During the first term of this academic year there were 1,393 registrations in the department of geography and industry, as it is called at Pennsylvania. Fifteen different courses are given in this department in the Wharton School of Finance and Commerce and ten men constitute the instruction force. Some of the courses are distinctly industrial and quite far removed from geography, as, for example, courses in employment management and in merchandising. In the courses that are distinctly geographic, however, there are 1,108 registrations. The largest course, in numbers, is a freshman required course given in the Wharton School of Finance and Commerce on Resources of the United States. This course alone is taken by 558 students. Other undergraduate courses in geography include regional study of the United States; manufacturing industries of the United States; geography of Europe; geography of Asia and the Far East; geography of South America; physical geography; climate and its economic influences. Three courses for graduate students are given; a geographic seminary; geographical environment; and field work in economic geography. In addition to the above courses offered in the regular work of the Wharton School, over 50 teachers from Philadelphia and nearby schools are taking geography in the college courses for teachers given at the university on Saturdays and late afternoons, and an extra-mural course in geography is given at Trenton to a class of 61. In the summer school, also, three courses are given regularly in geography. Counting the summer courses and the teachers courses, there are more than 1,250 registrations in geography courses this year at the University.

Association of American Geographers.—The thirteenth annual meeting of the Association was held in Schermerhorn Hall, Columbia University, December 28–30, 1916. In point of attendance and interest, the meeting was one of the most successful in the history of the organization. Thirty-four papers appeared on the program. The presidential address on "Geographic Provinces of the United States" was given by Professor Mark Jefferson. On Friday evening a symposium on the geography of the war was conducted by Professor D. W. Johnson. The program of this symposium was as follows: "The Plains of Northern France," Sumner W. Cushing; "Rivers and Marshes of the Eastern Front," Lawrence Martin; "The Danube Valley and the Balkan Complex," Ellsworth Huntington; "The Carpathian Mountains and Transylvanian Alps," Emmanuel De Martonne; "Geographic Aspects of the War on Water," J. Paul Goode; "Geographic Aspects of the War in the

Air," R. De C. Ward; "Economic Geography of the War," J. Russell Smith. Officers for the year were elected: President, R. De C. Ward, Harvard University; Vice-Presidents, W. H. Hobbs, University of Michigan, and H. H. Barrows, University of Chicago; Secretary, Richard E. Dodge; Treasurer, Francois E. Matthes, U. S. Geological Survey; Councilor, A. P. Brigham, Colgate University.

The Collins-Garner Congo Expedition.—Mr. Alfred M. Collins, vice-president of our Society, is to head a new expedition to Central Africa. As reported in *Science* for December 8, 1916, the expedition will leave shortly for the French Congo and certain of the neighboring parts of West Africa. It will be known as the "Collins-Garner Congo Expedition, in the Interests of the Smithsonian Institution," and will be headed by Mr. Alfred M. Collins, of Philadelphia, a well-known explorer and sportsman, who has made several trips to Africa and other regions in search of big game. Richard L. Garner, of New York, who has already made extensive investigations concerning the apes and monkeys of Central Africa, is manager of the expedition. The other members of the party are: Professor Charles W. Furlong, of Boston, scientist, artist and explorer, and Mr. Charles R. W. Aschemeier, of Washington, who represents the Smithsonian Institution as collector of natural history specimens for the United States National Museum. It is expected that Mr. Garner and Mr. Aschemeier will start for Bordeaux as soon as the outfit is ready, probably on December 9, and that Mr. Collins and Professor Furlong will follow about March 1, 1917."

Tidings from Stefansson.—On November 14 word was received from Vilhjalmur Stefansson, head of the Canadian Arctic Expedition—the first personal message since under date of August 22, 1915, he told of the discovery of new land at 78 degrees north latitude and 116 degrees west longitude. This is northwest of Melville Sound and northeast of Banks Island, which is itself east of Beaufort Sea. Cape Alfred, mentioned in the following excerpt from the long dispatch dated "Banks Island, Jan. 15, 1916," is situated at the northwest corner of Banks Island.

"I shall conduct two separate exploring parties in the spring of 1916—one of four sleds and six men, probably commanded by Storkensen, to go west and northwest from *Cape Alfred*, and the other probably commanded by myself, with four teams, to explore the *new land* discovered last year. The ice party should leave Cape Alfred by the first quarter of the March moon and be back at Banks Island by the middle of June. Of my party three men should return to the *Polar Bear* in June, but the other three will not try to return unless the area has been fully explored to eighty-three degrees west longitude.

"Otherwise we shall spend the summer in the new land or on Melville Island, putting up meat and marking advance positions for dog feed in 1917. In the event of our non-return, the *Polar Bear* will attempt getting north to pick us up, and we shall meet here then or hunt there up to the early part of the following winter. Should the work be completed as stated above, we shall try coming home in *1916*, and the souhtern section and some members of the northern section will go home anyway.

"Should the *Polar Bear* penetrate to Melville Island or further north, she will attempt returning by the Atlantic or Pacific route, according to the convenience of the plan of maintaining a reserve base at Kellett to retreat upon in case of the wreck of the *Polar Bear* further north. There would be no need to worry about us because of mere lack of news before *November, 1918*."

A second dispatch, which came at the same time, and like the former was published in the newspapers of November 15, read, in part:

"NORTH LATITUDE 78 DEGREES, WEST LONGITUDE 116 DEGREES (no date).—Because of a misunderstanding, resulting in lack of coöperation between the ships *Polar Bear* and *North Star*, the work of moving ice had to be postponed till the spring of 1917.

"The survey of the new land was well begun. From hills a thousand feet high, inland from Cape Murray, water and sky can be seen trending first north-northeast ten miles, then northwest thirty miles (estimated), but the coast line cannot be distinguished because it is low and snow has covered it."

The Wissahickon.—Members of the Society will be glad to know that Judge John M. Patterson's charming address on the "History and Romance of the Wissahickon," read before the Dickens fellowship last May at the Valley Green Canoe Club, Livezey Manor, Wissahickon Creek, has been published by the "Valley Green Echo" in a most attractive illustrated booklet of a few pages well worth reading. Judge Patterson revives the legends and brings forward historical facts of which too many of us are ignorant regarding this lovely glen which is still in its remoter recesses a terra incognita to a large part of our population.

Maize in Western Dakota.—Another indication of the possible extension of the agricultural zone of the Great Plains is furnished by a recent study of the agriculture of the Hidatsa and Mandan Indians, made by Dr. Gilbert L. Wilson, and reported by A. E. Jenks in *Science* for December 15. It is interesting to learn that in western North Dakota where maize has been a doubtful crop as grown by the white farmer, the Hidatsa and Mandan Indians have for centuries been successfully cultivating it. With crudest wooden and bone tools they developed an agriculture that in some respects surpassed that of most white farmers at present in that area.

Maize, sunflowers, beans, squashes and tobacco were raised by the Hidatsas, but their principal crop was maize. The chief varieties of maize were white and yellow flint, "sweet corn," and those producing white and yellow meal. Corn planting began when the wild gooseberry came to full leaf. The corn hills were prepared with digging-stick and bone-bladed hoe. The earth was raked over the seed and patted down with the hands. Each corn hill stood exactly where a hill had stood the year before. The fields were hoed twice during the summer. The second hoeing was accompanied by hilling up.

ACTIVITIES OF THE SOCIETY.

THE DANISH WEST INDIES.

BY CHARLES R. TOOTHAKER.

The opening meeting of the Society was held on the evening of November 1. President Henry G. Bryant gave a brief summary of the geographical accomplishments of the year. Referring to the prosperity of our own Society, he said the membership had now, for the first time, reached the 1,000 mark, one of the evidences of the growing influence of the Society in Philadelphia.

Charles R. Toothaker, curator of the Philadelphia Museum, then addressed the Society on the theme "The Danish West Indies," showing colored lantern slides of great beauty. The speaker expressed the opinion that the islands should be at once annexed, not as an investment but as a means of protection, and pointed out that in 1867 they might have been secured for $25,000. He declared that it was out of the question to allow any European country to anticipate us in the acquisition of so valuable a foothold in the West Indies.

THE HIGH SIERRAS.

BY WILLIAM FREDERIC BADÈ.

At the first intermonthly meeting, held on Friday evening, November 17, Dr. William Frederic Badè, of the University of California, delivered a charming address on "Bird Life and Mountaineering in the High Sierras," with illustrations. Doctor Badè, who is literary executor of John Muir, brought vividly home to his hearers the natural grandeur and the more intimate appeal of a mountain paradise in America.

AUTUMN EXCURSIONS.

The Excursion Committee, of which Miss Mary S. Holmes is chairman, and the other members are Miss Ruth S. Harvey, Professor H. C. Petersen, Mr. S. L. Schumo and Mr. Samuel Scoville, Jr., arranged a woodland walking trip from Gulph Mills to Radnor, on October 15, another excursion from Rosemont to the West Chester Pike through the "New Forest," on October 21, and a coaching trip for October 28 from Spring Mill through Lower Merion Township into Delaware and Chester Counties, with a wayside campfire luncheon and stops at various points of interest.

THE DEATH OF ECKLEY B. COXE, JR.

At a stated meeting of the board of directors of the Geographical Society of Philadelphia held on October 11, 1916, the following resolutions were unanimously adopted, and on motion the board directed that they be printed in the BULLETIN of the Society.

"WHEREAS the board has heard with sorrow of the death, at his home in Drifton, Pa., on September 30, of our fellow member, Eckley B. Coxe, Jr., and

"WHEREAS during the time he was associated with us in the management of this Society he won the esteem of his associates by his uniform courtesy and manly character and illustrated in his life a lively and generous interest in promoting scientific exploration and in the securing of valuable archæological collections for museums in his native city, and in his many activities illustrated a commendable public spirit, therefore

"*Resolved* that we hereby put on record our sense of the loss which the Society and the city has sustained in his untimely decease and direct that a copy of these resolutions be transmitted to his family."

The above is a true copy of the resolutions taken from the minute book.

J. E. BURNETT BUCKENHAM, M.D.,
Recording Secretary.

BOOK REVIEWS.

Ross, Gordon. *Argentina and Uruguay.* Pp. xiii, 308, illustrated. New York, The Macmillan Company, 1916. Price, $3.50.

The author evidently was in quite a hurry when he wrote this book, possibly because he draws so many conclusions based upon conditions which will cease with the European War. But this will not excuse the illogical arrangement of chapters and material within a chapter, nor the constant repetition which is present throughout the volume. Mr. Ross has collected many interesting facts, but his manner of presentation is not such as to leave them with the reader. The absurdity of devoting nearly a hundred pages to a survey of each of the provinces of Argentina, and then adding chapters on "Agriculture" and "Livestock," in which much of the same material is repeated, together with some new, must be readily apparent. Furthermore, the inclusion of long tables and solid pages from factual government reports is to be questioned as a means of spreading knowledge about the River Platte republics. The treatment of Argentina and Uruguay together, with frequent cross-references, has not been a success. Despite the close economic similarity of the two countries which would seem to make such a treatment possible, the author has generally left his reader confused.

There is little good geography in the book. For instance, the author's conception of the proper treatment of agriculture consists largely of stating that a certain province raises a certain kind of grain. We are also left with fine bits of information such as the fact that many of the Argentine rivers are dry much of the year, while those of Uruguay flow steadily, but without any explanation of the fact.

Despite all this, the book has one extremely strong point. It includes excellent character studies of the racial elements of both countries, which must be the result of long and close observation. Particularly interesting are the tales concerning the relationships between the oligarchies that control the political destinies of some of the Argentine provinces and the federal government, as is also the proof of the statement, "The native of the River Platte has contrived to get his country developed for him, while retaining the entire mastery of it." One of the strongest points made is the need for government encouragement to the "colonist," in the form of laws which will enable him to purchase land, so that he may really become a colonist in fact as well as in name. RICHARD H. LANSBURGH.

Smith, Randolph Wellford. *Benighted Mexico.* Pp. 390. New York, John Lane Company, 1916. Price, $1.50 net.

Do you believe that the negro question of Civil War times would never have troubled George Washington very much when it came to a head? That "he would have soon settled it by sending the negroes out of the country, forcing the North, which first profited by the slave trade, to share its expense; the South would have been relieved of the menace that will ever confront it, and that would have been the end of the negro question"? If you believe that quotation from Mr. Smith, you may possibly also believe all the remainder that he writes, including the rabid, violent denunciations and weak inferences drawn from unproven facts. Given one fact, proven or not, the author writes a chapter to exploit some predetermined idea. Wild tales abound and are repeated time and again, sometimes with varying facts, sometimes to prove opposite points. There is no rational, thoughtful conclusion contained in the whole volume, and at no other time in history, probably, could anyone have been prevailed upon to publish such a book.

R. H. L.

Stock, Ralph. *The Chequered Cruise.* Pp. 190. Illustrated. New York, Dodd, Mead and Company, 1916. $2.50 net.

This is the entertaining account of an ill-fated trip to the South Sea Islands. Three English people, two men and a woman, decide to make it a comparatively inexpensive journey. They voyage from England to Australia on an emigrant steamer; in Australia they purchase a forty-foot yacht, engage a skipper and start for the Pacific isles. The boat is wrecked on Norfolk Island, its second port of call, and after a visit to Fiji the outbreak of war disperses the party.

The amount of information which the book dispenses is not large, but that which is given is well told. The shipboard life of the "assisted" emigrants is vividly pictured; Lord Howe Island, the only place in the world, according to our author, where the Kentia palm, well known to us as indoor decoration, will ripen seed, is described with its wonderfully tame birds; and the acute economic situation on Norfolk Island, originally peopled by the "Bounty" mutineers and their native allies, is stated for probably the first time in a popular publication. There is also a survey of the Indian coolie problem in Fiji, and the book closes with an account, based on the author's own experience, of the favorable prospect for pineapple growing in certain parts of eastern Australia as an industry for men of small capital.

The forty-four photographs which illustrate the book, though small, are mostly clear, and add materially to its value. It is safe to say that the reader who begins the book will not wish to lay it down until he has finished the last chapter, and will feel at the close that he has received instruction as well as considerable entertainment.

WALTER LEFFERTS.

Schultz, James Willard. *Blackfeet Tales of Glacier National Park.* Pp. 242. Illustrated. Boston and New York, Houghton, Mifflin Company, 1916. $2.00 net.

The author of this book is one of the few old-time frontiersmen and Indian fighters left alive. He was adopted when a young man by the Blackfeet, married an Indian girl, and for years lived, hunted and fought in the company of his tribe. Now, revisiting his Indian relatives and friends and journeying with them through the recently created Glacier Park, he sets down a wonderful collection of interesting and poetic legends, told by their campfires.

The main purpose of the writer is to record the legends, and the bulk of the book is occupied with them, but items of other information occur here and there. We learn that the Blackfeet had as their original home the region of Peace River and Great Slave Lake, then came into Montana and forced the Crows, who had there inhabited, to retreat south of the Yellowstone River. The Blackfeet now have a reservation adjoining Glacier Park, and are allowed to hunt freely in this reservation, but apparently find difficulty in procuring enough food. Mr. Schultz states that from a tribe of three thousand not long ago, they have now dwindled to eight or nine hundred, and those who die largely pass away by diseases due to insufficient nourishment.

The increase of game in the Park itself is great. In ten years the mountains and forests will swarm with wild animals. Beaver are yet few, but are multiplying at a good rate. Although the Park is only five years old, the animals have become very tame. "The big-horn and the Rocky Mountain goats no longer flee from parties traversing the mountain trails, and the deer, elk and moose have become almost as fearless," says Mr. Schultz. The bears are as tame and as troublesome as those of Yellowstone National Park.

The style of the book is excellent and the occasional word-pictures of scenery are well drawn. The many sepia-toned photographs scattered through the pages are actual works of art, delights to the eye. Anyone who has visited the Park might well wish to possess this book for the pictures alone.

WALTER LEFFERTS.

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Geographical Society of Philadelphia

400 Witherspoon Building, Philadelphia

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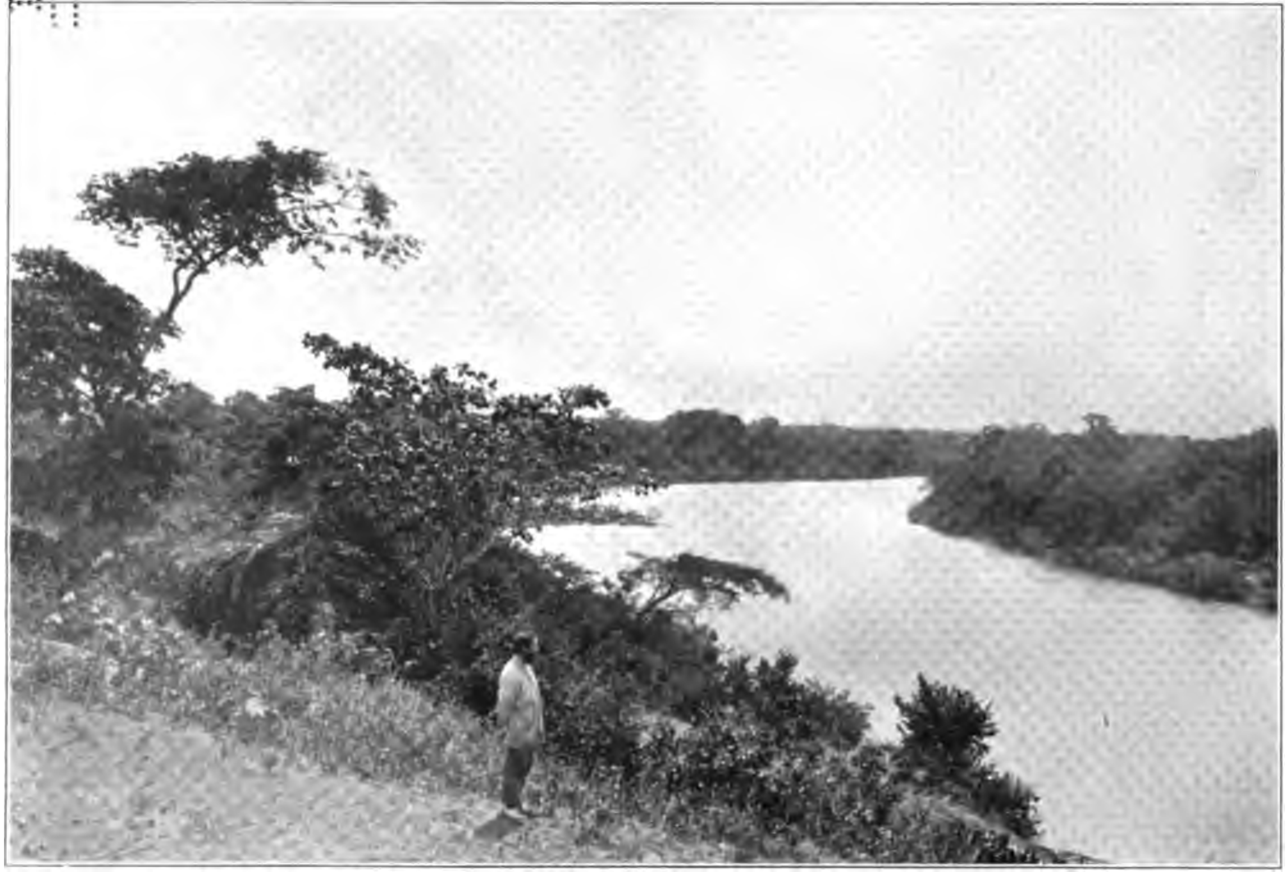

THE TAKUTU RIVER AT THE MISSION.

A PIONEER IN AMAZONIA: THE NARRATIVE OF A JOURNEY FROM MANAOS TO GEORGETOWN.

WILLIAM CURTIS FARABEE,

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At the end of July, 1914, the University Museum's Expedition left Manaos at the mouth of Rio Negro for an ethnological tour among the Indians of North Brazil and British Guiana. It was our intention to return to the Amazon by the same Branco-Negro route or by some other one of the northern affluents, but the trails between friendly Indians led three times across the Amazon watershed and finally to the head of the Corentine River. As our stock of medicines and ammunition was nearly exhausted we decided to descend this river—the shortest route to civilization. After nine months of interesting, difficult and sometimes very dangerous travel we reached Georgetown on the Atlantic Coast.

The party, consisting of Dr. Franklin H. Church, Joaquim Albuquerque, a Brazilian and the writer took passage on a small cattle boat bound for Caracarahy, at the first falls of the Rio Branco. For two days and nights we ascended the Negro, whose banks are so low that they have few habitations. Near the mouth of the Branco there are numerous large islands and one might easily pass by without realizing a great river had entered but for the difference in color of the waters of the two rivers. As the names indicate, the water on one is black and of the other white. The Negro takes its rise in the low marshy forest country where the Orinoco disputes with it the right of possession, while the Branco has its beginning in the mountains which form the boundary between Brazil on the one side and Venezuela and Guiana on the other. The Branco is so shallow on account of the great width that we were unable to travel at night. The pilots are experts at determining the depth by the current and finding the safest channel, but in the dark they are helpless. Even a powerful searchlight would be of little assistance. Twelve hours up from the Negro we made a stop at Santa Maria, a town of three houses, where we took on two thousand sticks of wood for fuel. All the launches in the Amazon Valley burn wood because there is no native coal. The wood costs at the rate of about $13 a thousand sticks. When a launch carries much cargo it is necessary to stop very often to take on wood because of the space required to store it.

The second day we came to the first open land where the grass came down to the river, the beginning of the great campo or savannah which stretches between the mountains and streams northward to the very foot of Roraima, three hundred miles away. The same day we crossed the equator and remembered that the sun was coming south as we were going north and that we should soon meet. The sun was thus so high that with the sextant we could not use it on the meridian for latitude. As we were traveling all day, it was more convenient to use the stars for all astronomical purposes. In the dry season there are not many mosquitoes to interfere with night work. At other times it was difficult to choose between the small flies and the mosquitoes. On the whole the night is better because there is little wind to disturb the mercury and one may get stars in many parts of the sky. On small rivers we often found it necessary to cut a few trees in order to see desired stars.

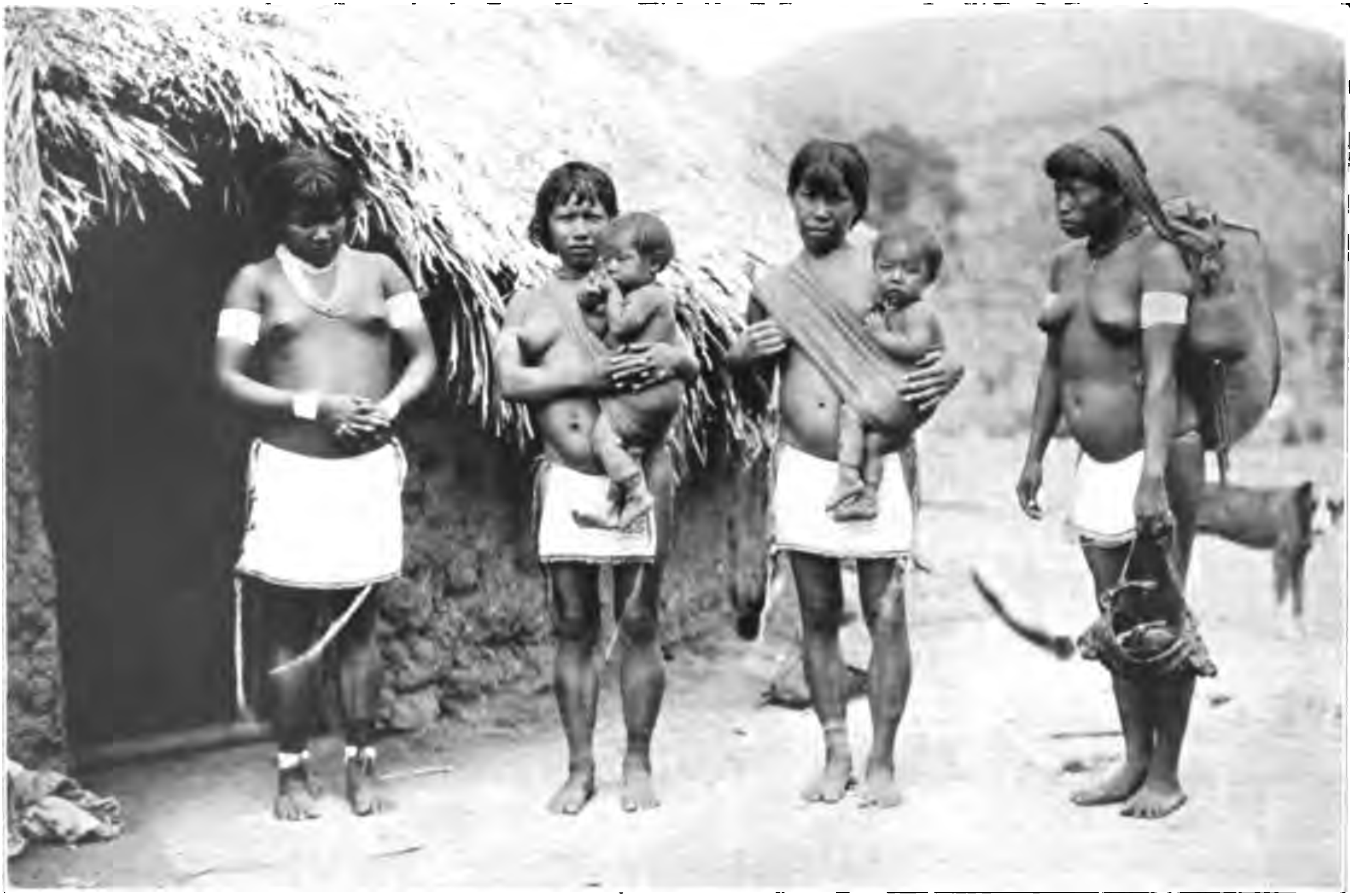
The third day up the Branco we reached Caracarahy, the transfer point for practically all traffic. A few large canoes go down to Manaos but the return journey requires so much time that it does not pay. Here one sees for the first time large herds of cattle waiting to be shipped to market. Some of them have been driven across country from the north but most have been brought down in batalons with kerosene launches. One batalon will hold about twenty head, and a fifteen-horse-power launch can manage two of them coming down stream. The cattle are given a chance here to refresh themselves before their two or three days fast on the way to the slaughter pens. The larger steam launches will carry two hundred head. To load them they are driven into the water alongside the launch, a rope is thrown over their horns and they are lifted aboard by the steam crane. Loading by the horns is not as cruel as it would seem. It is the safest and altogether the best method to use in such places, where the great changes in the height of the water and the shifting of the banks make any permanent appliance impossible. We never saw any cattle injured by this method.

From the rapids to Boa Vista we traveled by kerosene launch. The two batalons were taken back up stream for more cattle, but they were not heavily laden and the launch could pull them both except in the rapids, where it was necessary to leave one behind and return for it after the first had been taken over. In one of the rapids the launch was unable to make headway. The captain guided it slowly from one side of the river to the other hoping to find an eddy but he could not gain an inch. A rope was then carried up the bank and secured to a rock above, when four men pulled the launch with its load over the sticking place.

At the first house we were delighted to have an English Dominican Father come aboard and finish the voyage with us. He had come down from his station at the mouth of the Uraracuera to baptize some children. He gave us an interesting account of an unsuccessful attempt his society had made to establish a mission among the Indians on a branch of the Surumu River near the foot of Mount Roraima. The Indians were friendly, but they soon contracted introduced diseases, and after several had died the remaining ones fled into the forests. Father Thomas, deserted, sick and famished, finally made his way with one companion to the station and the effort to Christianize the Indians was abandoned.

When we reached Boa Vista, after seven days from Manaos, we spent a few days getting information and arranging for a canoe journey to the Indians on the Upper Uraracuera River. The village is now the center of the cattle industry and the seat of government for the whole Rio Branco region. The Judge of the Court called upon us and gave us valuable assistance. The federal government, a short time before, had established an agricultural experiment station here and had spent a very large amount of money in securing the services of trained men and in importing every possible kind of machinery that might be useful in such an undertaking. English, German, American and south Brazilian experts were secured at high salaries but the whole scheme seems to have been ill-advised and doomed to failure from the beginning. Vast sums were expended for machinery and appliances which could not be of service in such a locality. A thorough study of the possibilities of the region or the adaptability for agricultural purposes had not previously been made. After the money had been spent it was discovered that the rainfall which was only forty-two inches a year was not distributed throughout the year but that practically all of it came in the month of June. It was not possible to grow crops without irrigation and as no arrangements had been made for that emergency the attempt failed. Even if it had been a success it is very doubtful if the present population would have greatly profited by it, because they are too well satisfied with their present condition. They do not care to do the hard daily labor required by the planting and cultivation of their fields. Cattle raising there is a lazy man's job and after a man has spent a few years on a ranch he is worthless for any other purpose. If he works he must do it on horseback. He prefers to sell his cattle and buy farinha which he eats with dried beef. He likes fruits and vegetables and gets some from the Indians up river, but never grows them himself. He might have plenty of milk for his children but it is too much trouble to look after the cows every day.

Our first trip was to the Wapisiana Indian village on the Majari River, a northern branch of the Uraracuera. To reach the village we traveled one day across the savannah on foot. The village is located on a small level plain extending back from the high bank of the river to a low hill. When we came to the hilltop opposite the village we were surprised to see a dozen mudwalled houses in the midst of a cultivated area of fifty acres in which were growing corn, cassava, potatoes, sugar cane and various kinds of fruits and vegetables. They were living well on what the land produced. As we had been living wholly on dried beef and farinha, we were delighted to get some fresh food. We were led at once to the house of the chief by one of his nephews who had been traveling with us for several days. We told the chief we had brought something to trade for food and household articles. He asked to see what we had brought and sent for all the people to come into his house. He spread everything out on the floor where all could see and passed them out for examination. When a woman found something she wanted she kept it. When all had been accepted the chief took me with two of my boys and went to the different houses. As I selected things he gave them to the boys to carry. None of the owners were present. They could not go with us when we returned to our canoes



Macusi Women in Southern British Guiana.

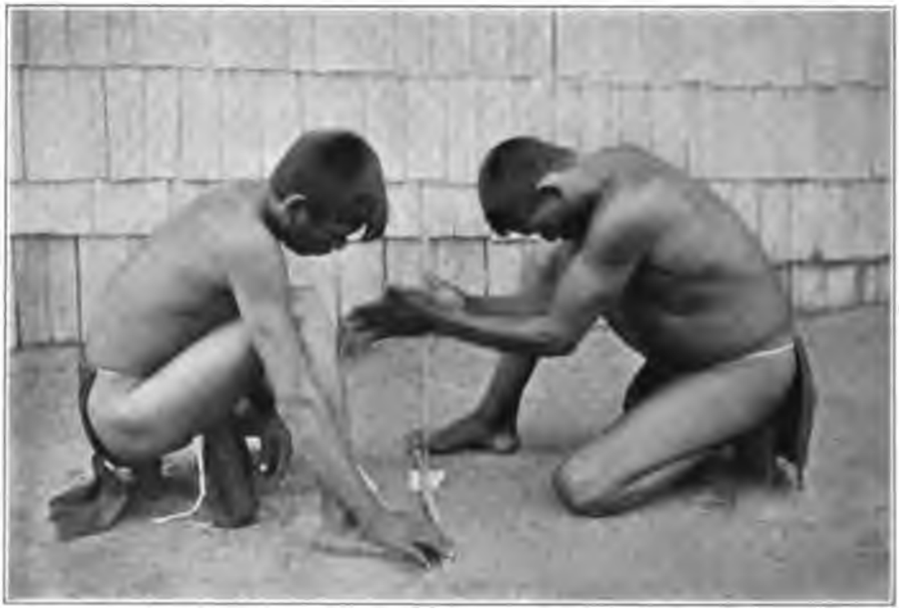
at the river but came the next day bringing all the things I had selected. One boy carried our trading goods over, but it required twenty-eight to bring our exchanges back.

We attempted to reach the Macu Indians near the Venezuelan border but were unable to do so because of rapids and low water. The maps show a great island in the Uraracuera. We went up the branch to the south called Maraca locally and succeeded in reaching a point three days by canoe further up stream than white men had previously gone. I was doubly disappointed. I wished first of all to see these Indians who have never been visited and I was anxious to determine whether or not there is an island. I do not believe there is any connection between the two streams higher up than where we went because: first, the Indians who have been up the Baraca know of no such passage; second, the Macus always come down the Maraca, which is much more rapid than the Uraracuera. There are whites fifty miles higher up on the Uraracuera. If there were a passage the Indians would use it.

The grass land is some twenty-five or thirty thousand square miles in extent; reaching from near the Venezuelan border half way across southern British Guiana, and from the southern forests to the foot of the Pakaraima Mountains: or from 58½° to 63° W. and from 1½° to 4½° N. For the most part it is a great undulating plain dotted here and there with round-topped mountains, some of which are covered with grass. Besides these very numerous single mountains there are also three short ranges which are more or less forest-clad: the Mocajahi, south of the river of the same name and west of the Branco; the Moon, between the head of the Takutu and the Branco; and the Kanuku, between the Rupununi and the Takutu. The first day after leaving the Negro the launch comes out from among the numerous islands into a long stretch of broad river and directly to the northward can be seen the irregular tops of the Marajahi, reaching up into the blue to the height of 3,000 feet. The mountains of the Moon appear to be the continuation of the Akarai chain which forms the southern boundary of British Guiana. They end in a series of detached hills with grass-clad valleys. The Kanuku Mountains are situated in the central part of the great savannah plain on the British side of the Takutu. They form a chain of picturesque mountains which extend in a compact group to the Rupununi. Beyond this river they continue in a broken series as far as the Corentyne River. The name applies particularly to the western end where they spread out in the great plain along the Rupununi. Here they are entirely forest-clad and harbor game of all kinds. The whole range has been thoroughly explored by gold prospectors who so far have been disappointed. The rubber gatherers also have gone over the whole region in search of the balata tree (*Mimusops globosa*). Between the Kanuku and the Pakaraima ranges the country forms a level plain interrupted by a series of depressions which become shallow lakes in the rainy season. During the long dry season the waters evaporate and they become great meadows whose numerous narrow streams are lined with beautiful Eta palms (*Mauritia flexuosa*).

One of these depressions between the Rupununi and the Mahu or Ireng was the mythical Lake Amucu on whose shore stood El Dorado or the Golden City. Rio Branco is the Parima of the Spaniards. It is said that a canoe can pass from the Branco across Amucu to the Rupununi in the height of the rainy season. It was possible to reach El Dorado on the shore of the lake from the Parima as the legend relates but it is very doubtful if the temples and houses were "overlaid with plates of beaten gold." There is no evidence that the Macusi Indians who must have inhabited the region at the time ever worked gold. The story spread and was believed then just as big snake stories are told and believed today. After a story becomes current any one who goes into the region in question must report the same story or no one will believe he has visited the place. If Raleigh had not heard of the Amazons, Lake Amucu and El Dorado no one would have believed he went far into the interior. If I should report that we killed snakes sixty or seventy feet long you would say, "yes I have heard of those before;" but when I say snakes of such dimensions grow in the imagination only, while those the forests produce measure but twenty feet, you at once say, "he was never there."

It is fortunate for the cattle owners that the country is undulating and that the hills are for the most part covered with grass because the low country is flooded during the rains and the cattle must take refuge on the higher land. By the middle of the long dry season the hills are parched and bare while the low valleys and



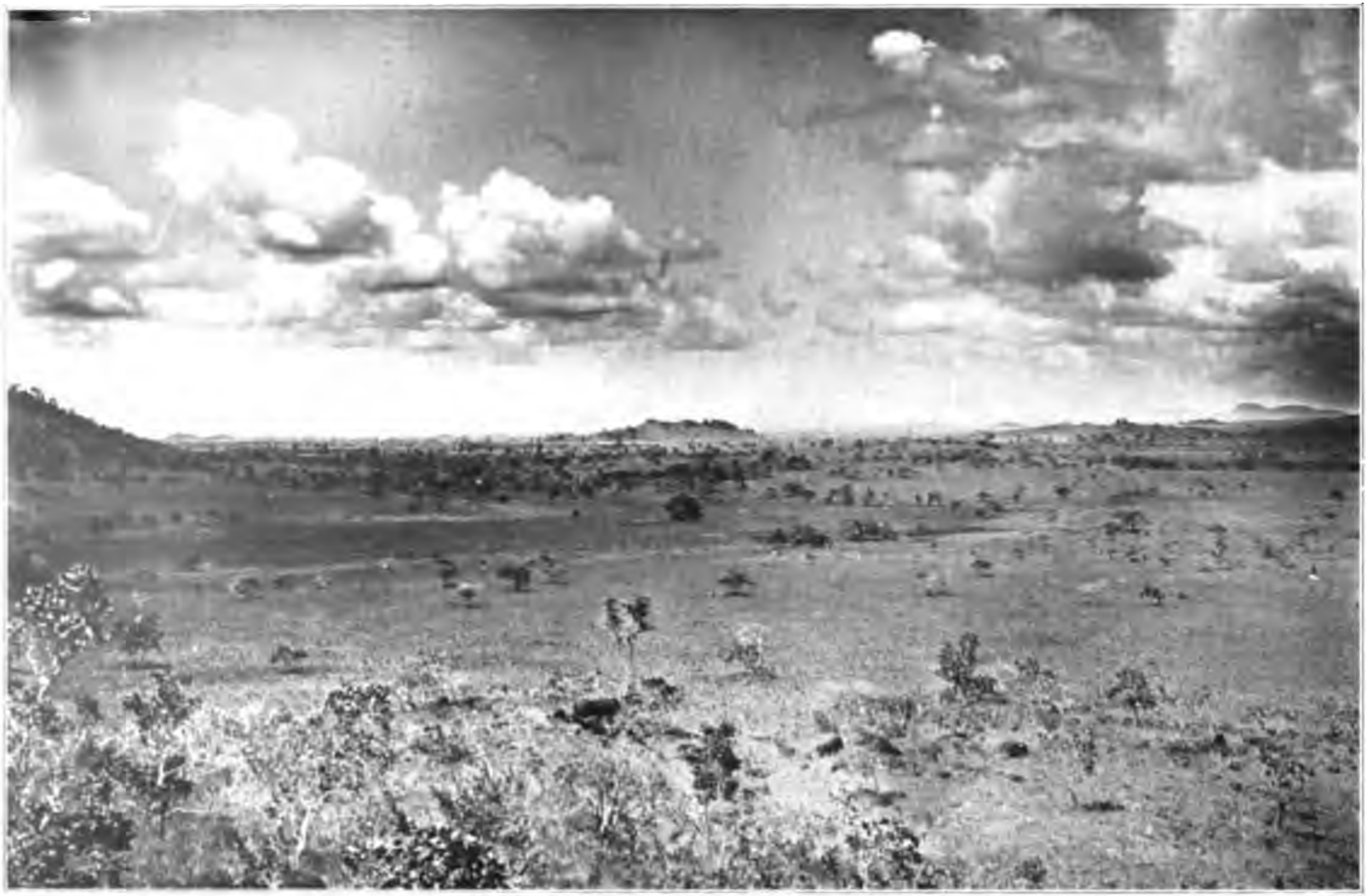
Wapisiana Boys Making Fire with two Sticks and a Bunch of Cotton.

in a certain "island," a small hill with large rocks and trees. M. and O. went out with the dogs to investigate. Each went around in a different direction. The dogs rushed in among the rocks. O. saw a large jaguar and shot it just as he heard the report of M.'s gun and called to M. to ask what he was shooting at. M. said a jaguar. O. said, " I have just shot it here," but as he spoke he heard a growl and dropping his gun he pulled himself into a tree in time to escape. As M. stepped from one rock to another a jaguar ran between his legs, while another jumped up on a rock not three feet away. Fortunately a dog caught it by the tail and pulled it down when M. shot it before it injured the dog. When the excitement was all over they found they had killed four jaguars in less than ten minutes.

The scenery of the savannahs is truly beautiful. The numerous mountains break the continuity of the level plains. The view is limited by more or less distant mountains or by lines of Eta palms which mark the courses of small grass-choked streams. From the high top of one of the "bald" mountains the view is greatly extended and the horizon is pushed back until it reaches from the interminable forests on the south to the lofty range of the Pakaraimas to the northward. The Eta palms fade into the general landscape and lines of green forests mark the courses of the larger rivers. The heat of the vertical sun is tempered by the constant winds which blow across the plain from the east.

The savannahs were first seen by the Dutch who made their way up the Essequibo River on trading expeditions to the Indians of the interior. These tribes were well known to the coast Indians because of the slave traffic. The Macusis spoke the same language as the coast Caribs and had many of the same beliefs and customs. On this account it would have been very easy for the Dutch to extend their territory over the whole Macusi territory, which was the northern half of the great savannah, but for the difficulty of river navigation. All the rivers flowing north from the savannahs are a series of falls and rapids. In 1738 Hortsman of the Dutch West India company was sent to find a passage to the Amazon and he was the first to cross the savannah. Waterman followed the same route in 1816, but Schomburgk in 1838 was the first to give any comprehensive account of the country and its inhabitants.

The two large tribes belonging to two different linguistic stocks



Photograph by H. P. C. Melville.

THE SAVANNAH COUNTRY OF SOUTHERN BRITISH GUIANA.

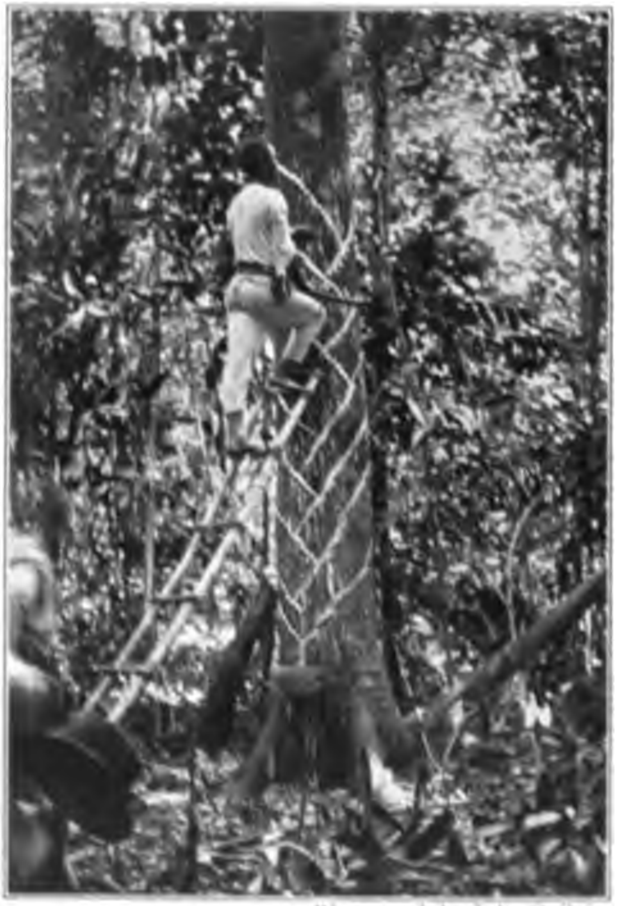
who have occupied the territory from traditional times are today living in contact with whites but for the most part have their old customs and beliefs. The Macusis to the northward are Caribs while their nearest southern neighbors are the Wapisianas who speak a dialect of Arawak. The members of these two stocks are traditional enemies and even today have little in common. They regard each other with aversion but there is no open hostility. The Macusis live about the foothills of the Pakaraima and Kanuku Mountains. Their fields are in the forests, where they clear a small plot of an acre or two at a time. They have learned that the rich soil of the hills will retain moisture and mature their crops even in the long dry seasons. Their houses are built in the open savannah where they have the advantage of the cool winds and are free from the mosquitos. On account of the cold winds that blow across the plains from the mountains at night, they build their houses with solid walls of adobe or cover them with a heavy thatch of palm leaves tight to the ground. The houses are large enough to accommodate several families, each of which has its own section with a fireplace. These families are closely related. When a man marries a woman he goes to live with her in her father's village. Her brothers, following the same rule, must go away from their village. So the women who are related remain and bring in men by marriage who may or may not be related. They practice that mysterious custom of the *couvade,* which is found sporadically in many parts of the world. When a child is born its father takes his bed for a month and observes certain established forms of conduct. For fear of evil effects upon the digestion of the child, he eats only the most delicate foods and takes no violent exercise. The custom seems based upon some fancied mysterious relation between the father and the child. The mother meanwhile ministers to the wants of both. While the father is required to remain in his hammock only one month the taboo continues on certain things for another month. He may work and hunt but must not engage in any violent exercise or kill any vicious animals. On a journey it is often difficult to get sufficient unprohibited foods. They have another custom which it is difficult for an outsider to appreciate. They have a peculiar staring appearance due to the absence of eyebrows. These they pull out, saying they interfere with clear vision. Absence of eyebrows is becoming according to their ideas of beauty. Their training to become good hunters is unlike that from any other part of the world. They hunt the deer in the open savannah, and hence must have good eyes to see him first. They must walk up near enough to shoot the deer with a bow and arrow and they do it successfully. When the deer puts his head down for a bite of grass the hunter walks but when he lifts his head to chew the hunter stands still. In order that the hunter may have good eyes to see the movements of the deer, he plaits a thong of fiber three feet long and as large as a lead pencil which tapers to a fine thread at one end. This he passes through his nostril and pulls it out of his mouth—one for each nostril every day for a month. After this he will be a good hunter.

The grass grows to the height of three or four feet and when it becomes dry is burned off by the Indians in order to kill the poisonous snakes that are fairly numerous in spite of this method of destruction. The most common are the rattlers, which grow to the length of three or four feet. They set fire also to drive the deer into their traps or blinds. They make a long net and stretch it across the runway. Several men hide themselves nearby and when the deer, driven by the fire, are caught in the net they rush out and kill them. It is more difficult to catch peccaries and tapirs by such a method. They may be shot by men in hiding. One may always know when there is a fire in any part of the savannah even if so far away that the smoke is not seen. The hawks attend all the fires and when they are seen high in the air all flying in one direction you may be sure where they are going. The fire kills great numbers of mice and insects besides the different kinds of snakes. The hawks by the hundred follow the fire close up to the flames and feast on the cooked flesh of the victims. They are very wise. If the fire is burning slowly against the wind the animals have time to keep ahead out of its way. The hawks have learned this and at such times will be seen working in front of the fire instead of behind it. I was surprised to find how slowly the fire travels even with the wind. We were caught several times by these fires. There is little danger because one can always build a back fire or failing a match he can select some place where the grass is short and rush through the fire. Where the grass is high the ground becomes very hot. A Brazilian cowboy, to save his herd of cattle, drove them over the hot earth and ninety died because their feet were so badly burned they could not travel. After the fire has passed the ground remains black for a few days, then the new shoots spring up and soon the whole plain is carpeted in beautiful green.

These hunters on the savannah remind me of some others we had an opportunity to observe. The most ferocious and unpitying hunters of the forest are the small black ants. They march with narrow front in bands of millions and attack every living thing in their path. Man and the larger animals take safety in flight but all the smaller things are mercilessly killed and eaten or carried away. Some appear to devote themselves to the killing while others under their direction carry off the booty. The slight noise of their pattering feet announces their coming. Many insects acting upon former experience or from instinct take warning and attempt to escape, only to find another enemy, as deadly but less harrowing. The small ant wren has learned to take advantage of an easy opportunity to get its food and follows along with the ants or slightly in advance of them. When any creeping or flying thing has been hunted from his hiding place by the ants and makes his appearance, the wren, from its low perch, flies out and gathers it in. The birds retire from the slaughter at night but the ants know no rest. Once on the Corentyne, in the middle of the night, Ogilvie and I awoke as a band was passing through our camping place. We had heard the tramp of their marching feet on the leaves and thought it was falling rain. We both at the same instant jumped from our hammocks to get our packs under shelter, but soon discovered our mistake. The ants with deadly grip fastened on our bare feet. Ogilvie ran into the river and remained until they had passed while I sat down in my hammock and killed the fellows on my feet. They did not climb the trees and enter my hammock. They went through and under everything in camp without eating or carrying away anything. Not even a foraging ant could ever find food about our quarters.

Colonel Roosevelt tells a story of a fish catching a monkey. I have a match for his story or rather mine is more than a match because I witnessed the performance. It is often said that a story is too improbable not to be true. These two natural history stories are true because we both have competent witnesses. I was traveling up the rapids in the Uraracuera River in northern Brazil and stopped on a ledge of rocks while the Indians went to look for the best passage. As I sat in the canoe, I noticed three large spiders lined up on the vertical side of a rock with their heads downward and their feet at the edge of the water. I wondered what they were waiting in that position for. The water was quiet and shallow. Near the bottom were a number of small fish and I thought they were probably the solution to the problem. They passed back and forth at a depth of four or five inches. The spiders made no move until a fish came near the surface, when an unsuccessful attempt was made to catch it. They failed because the fish was so deep in the water they could not hold him. Several times they failed, but finally one an inch and a half long was lifted out of the water and devoured. I had been watching for two hours; the Indians had returned in the meantime, but I could not leave until the game was finished. I have often fished for a longer time and caught less. I took a photograph then collected the lot and put them in the cyanide jar.

The southern part of the great savannah is inhabited by the Wapisianas and their nearest of kin, the Atarois. Their habits of life are naturally very similar to those of the neighboring Macusis. They belong to a different linguistic family and have a different body of myths. They start with a world readymade and a creator living on the earth with a younger brother. After men were created they were cared for by the younger brother, who brought them food every morning. The people, having nothing to do, decided to follow the animals which went out in the morning and returned in the evening. They found that the animals went to feed under a great tree which bore all kinds of fruit and vegetables and recognized this food as the same that they had been receiving. So the next morning they told the younger brother that they knew where he got their food and that hereafter he need not trouble to bring it for them. They would get it for themselves and save the necessity of returning thanks for it. He was angry and cut the tree down, having previously told them that they should prepare to take care of themselves. He told them if they would break off branches bearing the different kinds of fruit and plant them and water and cultivate them they would grow and bear fruit each after its kind in its own season. Thus they might continue to eat the fruit of the tree but they would have to work for it.



Photograph by John Ogilvie

TAPPING BALATA IN BRITISH GUIANA

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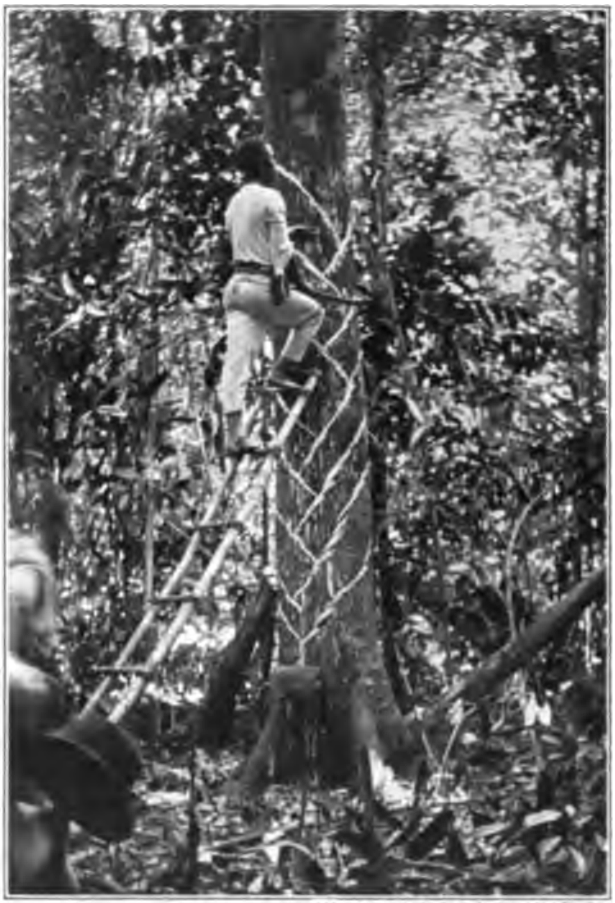

Photograph by John Ogilvie.

Bleeding Balata in British Guiana.

They began to plant as directed but soon grew tired of the hard labor and stopped before all the different varieties of clippings and seeds had been planted. So today they have only a few of all the great variety of the foods the tree bore. If they had been more industrious the world would have had food in plenty.

The stump of the tree remains to this day as a great granite boulder standing up out of the plain. When the tree was cut down, water flowed out and flooded the whole world and all the people were destroyed except a few who got into a duck's bill and floated to the top of the highest mountain where they were saved. After twenty days the waters began to subside and the people threw off stones to determine the depth of the water, thus they built up the small round-topped mountain nearby.

The southern part of the savannah on the British side has a great number of detached mountains risihg to a height of four or five hundred feet. All of these bear sacred names and are associated with the various creation myths. One mountain was the home of the god, another was where his son was buried, and another where he kept his dogs, which at that time were foxes. One is named for the virgin and another for her mother. Many shrines where offerings are made are located in the immediate vicinity. All this would seem to indicate that here was the original home of the people.

The western frontier between British Guiana and Brazil is fixed by the Ireng and Takutu Rivers from Mount Yakontipu in the Pakaraima range to the source of the Takutu Lat. 1° 52′, Long. 59° 37′, a mountain peak near the western limit of the Akorac range. The ends of this line and several points along its course have been fixed astronomically and accepted by both nations. The southern boundary of Guiana is the watershed line between the Amazon basin and the basins of the Corentyne and the Essequibo from the source of the Corentyne to that of the Takutu. The source of the Takutu has been agreed upon, but the source of the Corentyne remains to be determined. The irregular line of the watershed along the Akorac mountains has not been delimited and probably will not be for many years, because the territory is unimportant and uninhabited except by a few savages.

The eastern boundary between British and Dutch Guiana, accepted but never fixed by treaty, is the Corentyne River from its mouth to its source on the Amazon watershed. The source of this river has never been determined. These facts are given to show the importance of the geographical work done by our expedition in this region.

The explorer sets out to make a definite journey and bends all his energies to that one definite task. The ethnologist on the contrary only sets out, the journey develops and its direction is determined by the presence or absence of friendly or unfriendly tribes. When we went to Guiana we had no idea of making a long trip into the forest country, but at Dada Nawa, the home of Mr. H. P. C. Melville, magistrate and protector of Indians, we met Mr. John Ogilvie, a native of Scotland, who had spent several years prospecting for gold and rubber and was well acquainted with the whole region. From him we learned of tribes in the forests who had never seen white men. He himself had been the first to visit some of their villages. We persuaded him to take some of his Wapisiana Indians, whose language he spoke perfectly, and to go with us to see some of the interior tribes. Mr. Melville took a great interest also in our expedition and gave us every assistance possible.

All was finally arranged and on November 19, 1913, we set out with a pack train numbering sixty-two men, women and children, to carry across country five days to the Cuduwini River, where Mr. Ogilvie had two canoes which he had been using in rubber explorations. Our party was much larger than necessary because of the custom of the whole family going along as companions. Besides carrying the necessary provisions for our long journey they had to carry food for themselves, their babies, children and pets, because nothing could be left behind. Five babies rode on their mothers' shoulders above the packs while several other larger ones trotted along with the group of dogs. Small pups, chickens and other pets were carried in the arms of the older girls, who had loads on their backs. One great-grand-father, too feeble to carry a pack, added a little dignity to the lively party. On the way we passed through their traditional home, where everything was sacred. We made offerings of tufts of grass at the shrine of Wounded Knee, so that we might not become lame on the journey. We crossed the trails of evil spirits and stepped high like crossing a fallen tree trunk for fear we might encounter a passing spirit. One makes all these observances out of respect for the customs of his traveling companions.

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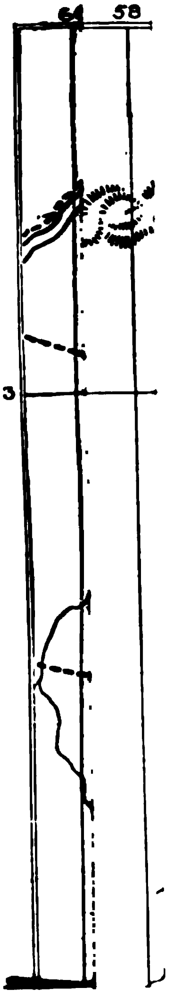

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they are today. There were two brothers in the beginning, the elder of whom was the creator. They lived in separate houses and ate their food raw. They found some bones on a rock near the river and wondered what animal had been eating there. So they set a watch, who caught an otter. They questioned the otter and he told them a woman was living in a deep pool nearby. They thought they would like to have her and made themselves hooks of the jaw bone of a paca and went fishing for her. They soon began to pull up pots, baskets, trays, sieves, etc.[1] They fished all the forenoon but failed to catch her. In the afternoon they caught her hammock and a lot more pots and baskets. The elder brother became weary and fell asleep and while he was asleep the younger brother caught the woman and took her to his house, thinking he would keep her for himself and not allow his brother to know about it. He hurried back and went to fishing again. Presently his brother awoke and asked what he had been catching. "Oh just the same kind of things," he said, and pointed to the collection. The following morning he was late coming to fish and when he came took so little interest in it that his brother accused him of having caught the woman while he was asleep. On account of a very serious accident, which subsequently affected the whole human race and which I cannot tell here, he was compelled to acknowledge the fact and to say that he had taken her to be his wife. Thus she became the mother of the race. She was the daughter of a great Anaconda; hence they revere the snake today and will not kill it. When one is encountered they speak to him and call him uncle but never molest him. They call old men also by the same name.

One Taruma chief and five men joined us for the trip to the Waiwais and furnished more food for us. In two days we reached the first village at the mouth of the Shudikarwau, a small stream, where we left our canoes and built a shelter to cache food for the return trip. At this point the Essequibo is very shallow and reduced to a small stream. The temperature of the water at ten o'clock was 77° while that of the air was 85°. Elevation above the sea was 700′. Numerous mountains may be seen from the bends in the river, but they are about one thousand feet high instead of three or four as reported.

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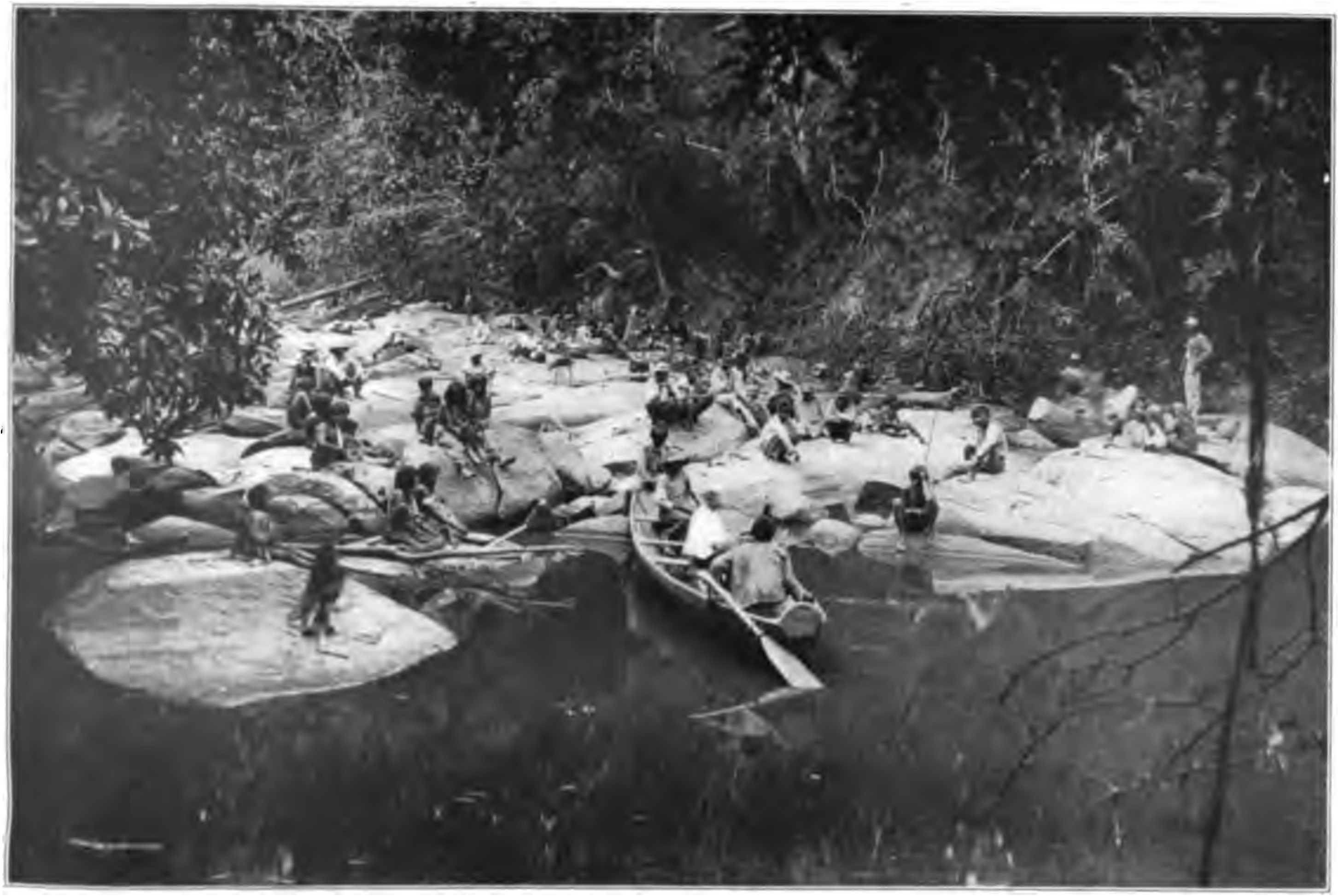
[1] When telling the story they go on enumerating all the things a woman has about the house and then say, "Oh, you know! A woman always has so many things!"

The balata tree which was so common in the Kanuku Mountains becomes more and more rare as the higher land is reached. South of the Cuduwini it is hardly worth working and at the Kamu it has practically disappeared. Neither the green hart nor mora are found here. The Brazil nut is very rare north of the Akorac Mountains, although very common in certain localities to the southward.

We left the river in Lat. 1° 31′ N. and Long. 58° 30′ W. and started into new territory which no one except the members of our party has ever traversed. Ogilvie had previously crossed the divide to the Waiwai village. Schomburgk in 1837 went up the Caneruau, a branch of the Essequibo, and crossed the divide in Lat. 0° 45′ N. to a Barokoto Indian village on the Darakityu, Lat. 0° 12′ S. He later found the source of the Essequibo in Lat. 0° 41′ N. In 1843 he crossed the divide again in Lat. 1° 30′ to the Apiniwau, which he descended. In 1884 Coudreau crossed the divide by the same trail, no doubt, to a Mapidian village on the Apiniwau and then returning took a trail on the divide for a Waiwai village to the southwest. We must have crossed his trail the second day after leaving our canoes on the Essequibo. The Waiwai chief acted as our guide over a winding trial which no one unacquainted with the country could possibly have followed. We followed up the Kamashoko, a branch of the Shudikarawau, crossing and recrossing many times until we came to a high hill on the west side which we crossed to the river again. The stream here was very much smaller. The guide said it joined another stream below where it made the turn around the hill. The following day we came to a broad valley in the center of which was a large lake occupied by an evil spirit. No one dared to live near the lake because the spirit killed so many people. Finally a young woman was thrown into the lake alive as a sacrifice. She is still living in the lake with the spirit and he is so well satisfied that he kills no more people. We made our way around the western end of the lake with great difficulty. There had been a fire around the lake which had killed the forest for a long distance to the southwest. Many trees had fallen and remained with their great branches standing in the air. The ground was so boggy that we had to make our way over the trunks of the trees for two miles. All trace of the



Cuduwini Landing. Beginning of the Long Canoe Journey.

trail was lost and the guide had some difficulty in finding his way. Beyond the lake we crossed a trail leading to another Waiwai village two days journey to the southwest—probably the one Coudreau visited. The second night was passed at the foot of the Akorac Mountains. It was so cold during the night that we built fires under our hammocks. I slept in woolen pajamas and a five-pound army blanket but with the thermometer at 68° the fire felt good. Many times on damp cold nights we found it more comfortable to have fires built under or between our hammocks. The Indians build a triangular shelter with poles or trees at the angles and have a fire in the middle. Three or six hammocks hang between the poles around the fire. This is the best type of shelter I know, as it gives a place to cook over this fire and a place under the roof to dry wet clothing or packs.

The third day from the Essequibo we crossed the divide at an elevation of 1,600 feet in Lat. 1° 11′ N. and Long. 58° 30′ W. The mountains here extened from southwest to northeast at an angle of 35°. The place we crossed was much higher than the range on either side of us and bears the name Tirikir. When the boundary is finally fixed this mountain peak, the highest of the range, will be found of great value as a station for triangulations. The north side is very steep, while on the south the slope is more gentle. From the stream on the north to that on the south is only four hours. The timber in the region is small and of little value. In the lowlands the vegetation is dense and difficult to penetrate.

Indian trails usually go over the highest points because all trails are primarily for hunting purposes. Many animals and birds find on the high land the nuts and fruits they prefer. While resting and making observations at the summit a troup of large monkeys came along and Ogilvie shot one. Although mortally wounded it held on for some time and while we were waiting for it to fall an eagle came along and carried it off. This is only one example which shows the struggle for existence one engages in continually in the forests. When traveling along the river the birds we shot often fell into the water and when they did it was always a contest to see whether we or a fish or an alligator would be the first to reach them. Many times we never saw the bird after it touched the water. One time my Indian boy called a curassow for me to shoot. We were in

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They began to plant as directed but soon grew tired of the hard labor and stopped before all the different varieties of clippings and seeds had been planted. So today they have only a few of all the great variety of the foods the tree bore. If they had been more industrious the world would have had food in plenty.

The stump of the tree remains to this day as a great granite boulder standing up out of the plain. When the tree was cut down, water flowed out and flooded the whole world and all the people were destroyed except a few who got into a duck's bill and floated to the top of the highest mountain where they were saved. After twenty days the waters began to subside and the people threw off stones to determine the depth of the water, thus they built up the small round-topped mountain nearby.

The southern part of the savannah on the British side has a great number of detached mountains risihg to a height of four or five hundred feet. All of these bear sacred names and are associated with the various creation myths. One mountain was the home of the god, another was where his son was buried, and another where he kept his dogs, which at that time were foxes. One is named for the virgin and another for her mother. Many shrines where offerings are made are located in the immediate vicinity. All this would seem to indicate that here was the original home of the people.

The western frontier between British Guiana and Brazil is fixed by the Ireng and Takutu Rivers from Mount Yakontipu in the Pakaraima range to the source of the Takutu Lat. 1° 52′, Long. 59° 37′, a mountain peak near the western limit of the Akorac range. The ends of this line and several points along its course have been fixed astronomically and accepted by both nations. The southern boundary of Guiana is the watershed line between the Amazon basin and the basins of the Corentyne and the Essequibo from the source of the Corentyne to that of the Takutu. The source of the Takutu has been agreed upon, but the source of the Corentyne remains to be determined. The irregular line of the watershed along the Akorac mountains has not been delimited and probably will not be for many years, because the territory is unimportant and uninhabited except by a few savages.

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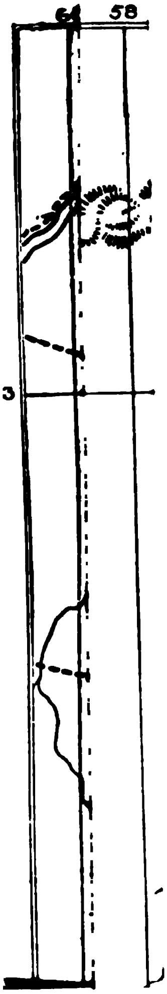

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village had known each other as boys. At their last meeting, probably twenty-five years before, one had bought a dog from the other but had not paid for it. As soon as greetings were over it was mentioned and settlement made at once.

On the short journey from here to the Mapidian village we passed through a small savannah of two or three hundred acres on higher land in the center of the forest. The Indians knew no other savannah. Although so confined it had the small trees and shrubs, the birds and insects characteristic of the large savannah several hundred miles away. We had been smothered in the depths of the forest so long it was a delight to be able to stand up straight, to get a little view and a fresh breath of clear sunlit air. The heavy forest has a very depressing influence upon the traveler.

At the village we learned more about the Diaus. The chief's son had two wives from this tribe who had been brought when small girls to a neighboring tribe but knew nothing of their own people. They had forgotten their language but had remembered their songs and dances. They remembered also how to make pottery which was much better than that made by the Mapidians. They differed physically from the other tribes we had seen and we were the more determined to visit this tribe.

The language of the Mapidians seemed very unlike that of their neighbors but sounded more like that of the Atarois. We had learned of a tradition among the Atarois that a part of their tribe went over the mountains toward the southeast in ancient times and disappeared. These people have a tradition that their ancestors came from west of the Essequibo. No doubt, they are the lost Atarois. Many of their myths also were similar to those of the other Arawak tribes, but differed in minor details. They have the same story of creation of animals as is told among the Wapisianas. The creator bears the same name—Tuminkar.

When the creator made an animal he gave it the proper form, size, color, voice or call and then asked it where it wished to live and what it wished to eat. The first one created was the jaguar and while Tuminkar was putting the last spots on his skin he asked him where he wished to live and what he would eat. The people were standing about watching the operation and when the jaguar saw them he said he would live on the ground and eat men. The next animal was the big black monkey. When he was questioned he looked about and seeing the jaguar said he would prefer to live in the trees and eat fruit. While the tapir was being made the monkey was looking on. He said to himself: "If that fellow should choose to live up here he would break the trees down and be a great nuisance. He ought to live on the ground but I know he will not want to live with the jaguar." He climbed down on a low limb and when Tuminkar asked the tapir where he would like to live, the monkey whispered in the tapir's ear, "Don't say anything" and the tapir was silent. Tuminkar repeated his question and the monkey again whispered in the tapir's ear, "Don't answer" and again he was silent. Then Tuminkar said to the tapir, "you stupid fellow, go away and get your living wherever you can." Therefore, the tapir is still silent and although he lives on the ground he eats the leaves of the trees which he pulls down with his long nose.

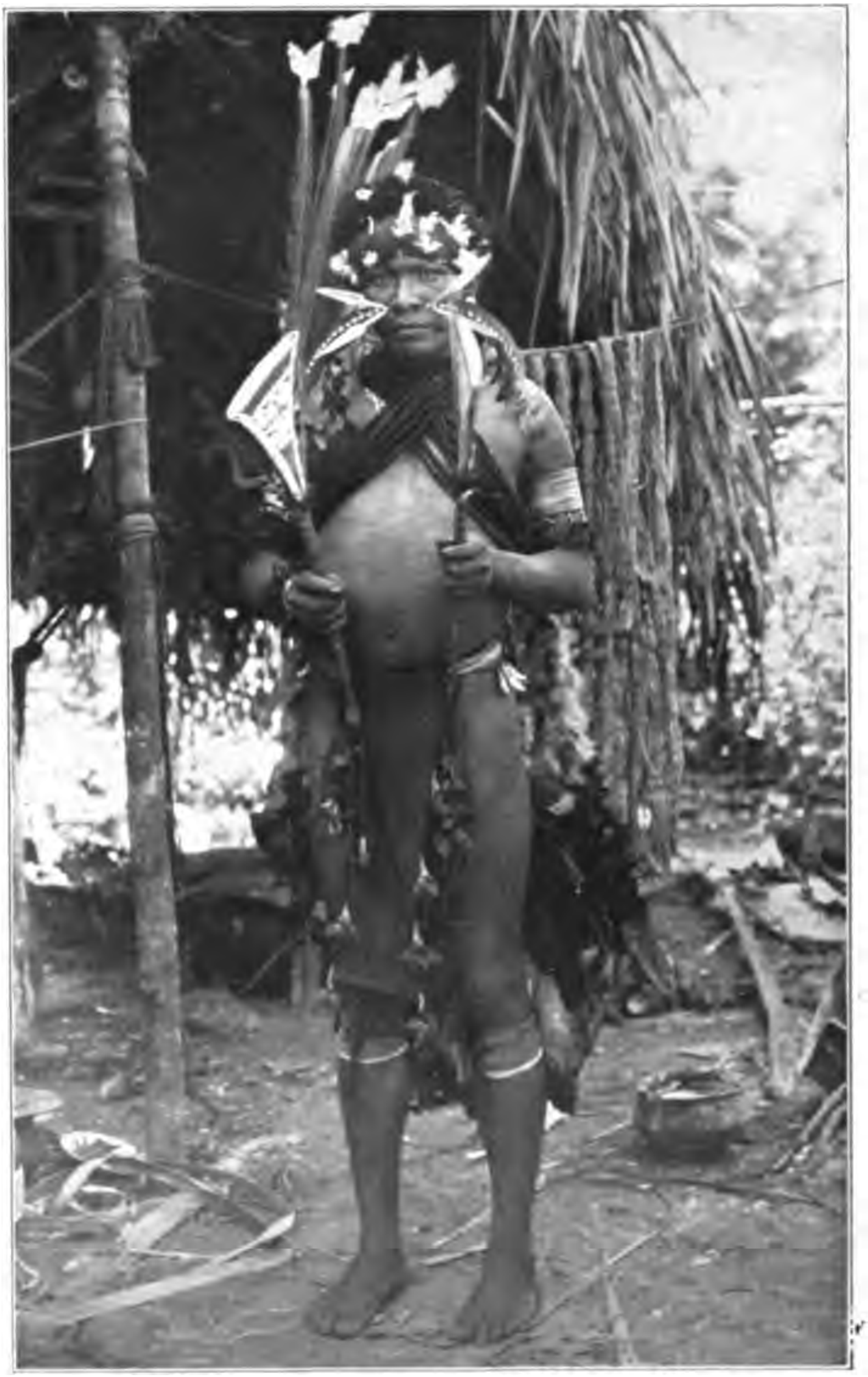
They believe that at death the soul, which is about the size of a newborn babe, goes up above and remains there with Tuminkar forever. There is no other life. When we left we gave the old chief some presents, for which he was very thankful. In parting he said: "I am an old man, I shall soon go up above and when I get there I will watch for you and when I see you coming I will tell Tuminkar how good you have been to me." This was the only time in all my experience that an Indian gave expression to feelings of gratitude. They often show it but say nothing. They return kindnesses in the same way that we are expected to do.

No one had been over the trail for several years to the next village on our way to the Diaus. The trial was overgrown and obliterated. Some of the men however knew the direction. When there are no open trails it is much easier to follow the highland even when the distance is much greater. The man who had been last over the trail did not want to go, or rather tried to persuade us not to go, because the way was so long and so difficult. He said we should be two days and nights on one mountain without water. That kind of thing is easy enough when you know it beforehand. Half way along the mountain we found a tapir trail and knew at once that we should find water soon if we followed down the side of the mountain. Our boy went down and returned in half an hour with plenty of water. From the highest point we could see the broad flat plain which we had left extending to the southward between the range which we were crossing and the one I had seen from the top of Paiufon. Our elevation was about 1,500 feet, but the mountains to the south of us seemed much higher. The Waiwĕ village we found on the opposite side of the Puduwau or black river. The Mapuerwau and all the other streams we had crossed had clear water. Knowing the Negro we suspected that this river had a similar origin and were later able to confirm our suspicions. This river was larger than the Mapuerwau and from their courses and the direction of the southern mountain range it is quite certain they unite to form one of the large tributaries of the Trombetas. We enquired about going down this river in canoes. They said it was impossible on account of great falls a short distance below and also because there were no Indians living on the river. They had never heard of savannahs, cattle or white men.

They had never seen matches or guns and were interested in them but had no use for them. The chief asked me to fire my gun at a tree. He was nearby and I expected to see him jump but he never moved a muscle. He was greatly surprised to find the ball had gone through the tree. I was using a 30 × 30 Remington and selected a very soft tree for my target. None of the Indians would eat any game we killed with our guns. They would take anything we offered them to eat but would throw it away, fearing it would do them some harm. In one tribe they threw away the first we gave them and immediately asked for more, which they ate. They seemed to think that what we had prepared for them might do harm but that we were eating ourselves would be safe for them. When some of the men who had come from the last village were ready to return they came to me and asked me to undress. An ethnologist takes every opportunity to learn the customs of his people, so I complied with their wish. Then they each rubbed me from head to foot with wet raw cotton. At the time I had no idea what it meant but later learned that they had baby boys at home whom they would rub with the same cotton so they might grow to be big strong men. They are but five feet four in height while I am six feet one. Naturally I appreciated the compliment. From their point of view, this was a bit of scientific treatment and gives a good idea of their stage of mental development.

To the next village our way led for two days up the Puduwau to a fording place where two trees had fallen from opposite sides of the river and met in the middle, forming a foot bridge. We had crossed rivers on logs at every angle and at great height but this was our most trying passage because the logs were waist deep in the black rapid water. One had to feel his way with his feet, climb over limbs and change logs in mid stream. The cold water assisted by nervousness brought on my fever with chills and we had to go into camp. When one is hot and exhausted from traveling in a temperature of 95° and then plunges into water ten degrees colder than the air for twenty minutes the shock is very great. On the way one of our Waiwĕ men was struck by a very poisonous snake, the Jararaca. We were near and immediately gave him our treatment which they did not resent. Afterwards at my suggestion the chief gave him their treatment which consisted in spitting on the wound, blowing through the hand on the different joints of the body and singing a soothing song. Within three hours, he seemed to be suffering less pain and his pulse was more nearly normal. His suffering the first two hours was intense. We built a shelter for him and left him there, with his wife, who happened to be traveling with him. They were both carrying food which we left with them. The chief returned in two weeks but we never learned how he found the wounded man. He was the last in the line of sixteen. We asked ourselves what we should have done if it had been one of us. We always kept one or two Indians in advance because they are better acquainted with the habits of the poisonous snakes and know better where to expect them. The worst place is about a deserted house.

From the Puduwau we crossed the highest mountain on the trail at an elevation of 2,000 feet, and followed for several hours down the crest of a hill until it disappeared in the plain. The high mountain ended a short distance to the west of our trail. Here we got a view to the northwest and learned where the dark waters came from. Between us and the high land of the Apiniwau watershed fifteen miles away was a great swamp land with little forest which even at that season was impassible. At the Parikutu village we were delighted to find the chief could speak Taruma, because our chain of interpreters was broken when the Mapidians returned. His father was with Schomburgk in 1843 on the Corentyne but did not



WAIWAI MAN IN DANCING COSTUME.

return to the Essequibo with his companions. He went south instead and married the daughter of a Parikutu chief. He taught his first son to speak Taruma, but he had died long since and the boy, now an old man, had forgotten much of the language. He had never seen a Taruma before and enjoyed talking with him so much that he went with us to three other tribes. He told us more stories about the Diaus but refused to go with us to see them because it was so far away that he would die of old age before he could get back home.

The Chikenas of the nearby village had been recently driven up the Kichuau by their enemies who had burned their village and killed all the people who were present at the time. These few had been away from home and as they returned they found the dead bodies of their friends and the burning village. They made their escape before being detected. The people of the village had been blamed for sending sickness to their neighbors. Men would live forever but for diseases which are sent by enemies. This superstition is responsible for the deadly wars which have destroyed nearly all the people. At this village we met the oldest looking man that any of us had ever seen. Unfortunately there was no way of telling his age. He brought sweet potatoes which he and I ate with salt. None of these forest people use salt but strange enough this man liked it the first time he tasted it. Salt was the only thing we carried, thinking it the only necessity. Some of the savannah Indians evaporate water from shallow lakes while others get their salt from burning certain grasses.

Again we made three woodskins, and started down river, thinking we should continue to the "great river," the Apiniwau, but after four days we came to the territory of their enemies where it was unsafe for us to travel. We sank our woodskins and crossed the mountain without a trail to the Ponoma River, which flows into the Apiniwau higher up stream. This walk was the most disagreeable of them all. It rained a part of every day and then the sun came out, but the forest was so thick its rays could not reach us. It was something like a walking Turkish bath. One night near our camp we saw a lot of small phosphorescent plants and this started the men to talking about how fire was first produced by collecting these plants. Hardly a day passed that something new of ethnological value did not turn up.

At the Ponoma we made three more woodskins and new paddles. One morning as we came around a short turn we were startled to see a big puma, or mountain lion, standing on the bank of the narrow stream not twenty feet from us. I was anxious to see what an Indian could do with a bow and arrow and asked my best man to shoot it. He untied his bundle, selected a bow and strung it, then selected an arrow, complaining all the time that there was not a good one in the lot because they all had wooden points. When he was ready he stood up in the end of the canoe and we swung him around until he shot about fifteen feet. The puma had not moved all this time but watched us intently. The arrow hit him in the breast but the point would not pierce the skin and the arrow fell broken at his feet. He recoiled slightly when hit, took a step towards us as though he meant to jump into the canoe, which he could easily have done, then turned and walked away into the forest.

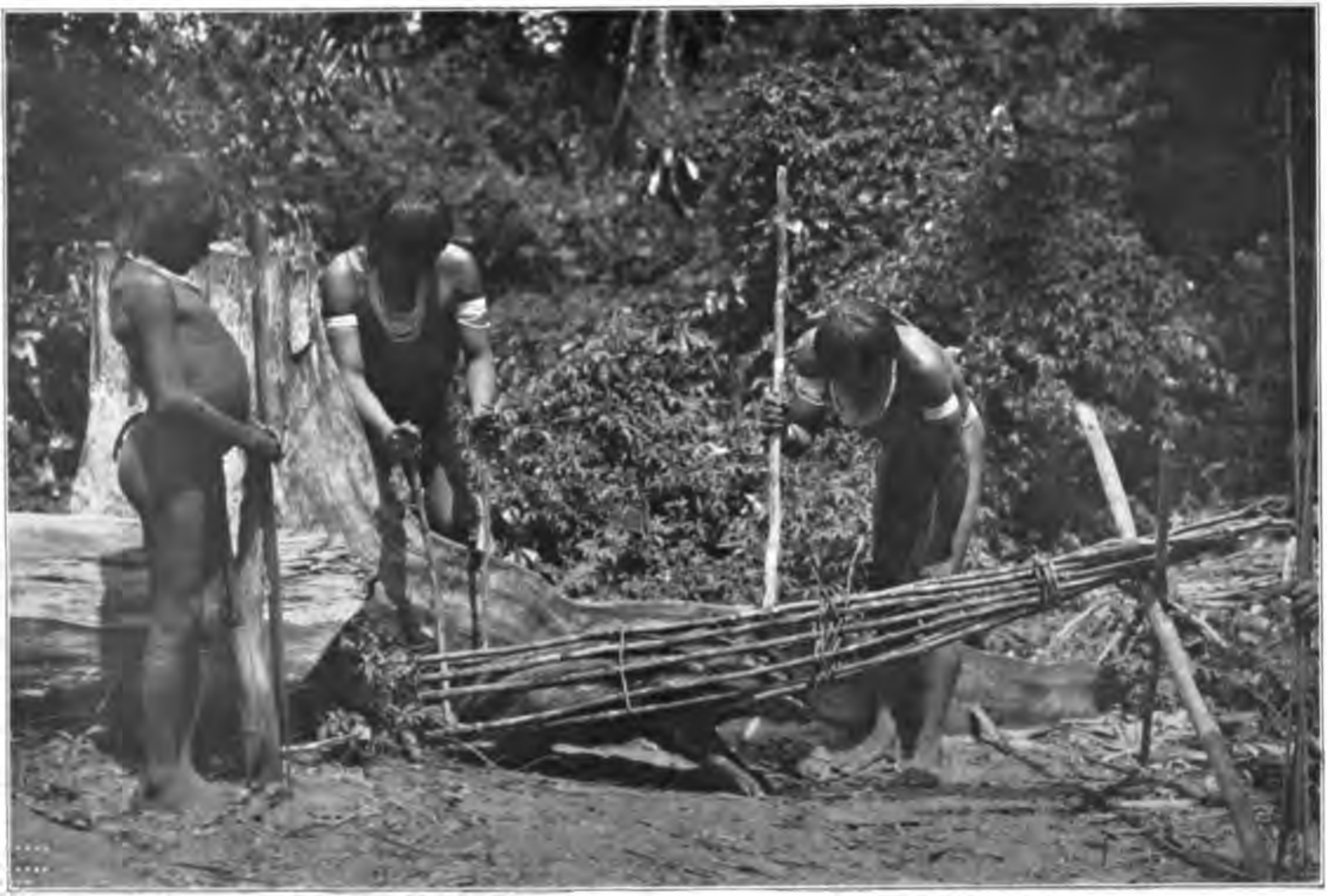
At noon the third day we reached the broad Apiniwau. Our companions struck the water with their paddles and gave a great shout. We found shelters built on the high land at the point between the two rivers. Indians had been there recently eating sugar cane. We knew there must be a permanent village within a few days journey but there was no way to tell whether it was up river or down. We decided to try up river first and when we reached the first bad rapids we knew the Indians had gone up stream and had not returned. Traveling up stream they unload their baggage on the rocks and carry the canoe over first; then return for the baggage and put it at once into the canoe. Some refuse is always left behind. If they had been going down stream this evidence would have been found on the rocks above the rapids. We followed up stream and by the end of the second day could appreciate why they had been eating sugar cane. We could get neither game nor fish and very little fruit. We watched the banks closely for landing places. The cane chips were fresher and we knew they were not far ahead. The Indians do not clear the land to the river but leave a strip of forest so one may easily go by a village. The canoe following the left bank found a ladder—notched log—leaning against a high bank. A trail led from here to a clearing in the midst of which was a large communal house. The people had evidently gone visiting and had taken all their live stock with them as is their custom. We helped ourselves very liberally to sweet potatoes and sugar cane because we had been working hard against the current for two days with nothing to eat. It proved to be a Kumayena village whose inhabitants had gone up river with the people in the canoe we were following.

The live stock consists of dogs, chickens and other pets. Chickens are very valuable and not all can afford to have them. They do not eat the chickens nor their eggs because the fowls are unclean, but they keep them to hear the cocks crow. In the morning when they hear the crowing they wake up, talk awhile and go to sleep again, just as civilized people do when they hear the alarm clock.

Another half day brought us to the Parikutu village we had heard of as being somewhere on the river. If we had turned down river instead of up, it is difficult to say what should have become of us, because there are no Indians for several hundred miles below. The chief now traveled in front so that he would be the first to see the people. When he saw a canoe in the distance he gave us the signal and we hid ourselves while he went on and told the people that white men were coming. He soon returned for us and took us up to the village. To our surprise all the men were lined up with bows and arrows ready to shoot. The chief, who carried a large bright knife, motioned us to a seat on a log. He did not come to greet us as was the custom in all the tribes but sent his daughters to speak to us while the men stood on guard. They were all very much frightened and nervous. We endeavored to reassure them by being as calm as possible with a forest of arrows pointing in our direction. As usual when entering a strange village we had left our guns and bows and arrows in the canoe. An Indian, unlike some civilized men, will not attack a defenseless man. They apparently decided after some time and a lot of talk that we did not mean to do them harm. However, the men with their arms accompanied the women everywhere they went for two days. But we soon gained their confidence and spent two weeks with them so pleasantly that when we were ready to go, Ogilvie said, "what a pity we must leave such splendid people."

Here we met a member of the tribe we had heard so many stories about, a Diau. It was he whom we had been following up river. He had come to invite the people of this village to attend a dance in one of his villages. As it was twelve days away the chief had decided not to attend. He agreed to take us to the dance, where we could meet a trader from a long distance to the eastward. He said they did not make the knives and beads, etc., but that this trader got them from black men who did make them. I had been interested to know how all these tribes speaking dialects of the Carib language could send messages and keep records. We found a woman once at a landing place on a river waiting for her husband who had been absent about two months. She was expecting him that day and he arrived the next morning. They use knotted cords with a knot for each day until the event. They untie a knot each day and thus can tell when the time has arrived. A man knots two cords and leaves one of them with his wife. A chief knots a number of cords and sends them along with invitations to the dance to the chiefs of other tribes and they all arrive on time. As a dance lasts for a week or until the food and drink are all consumed it would not matter if a man should forget to untie a knot one day. They are not as forgetful as we are. With the morning paper at hand we can keep our dates straight, but how many of us away in the forest could keep our calendar correctly? It is much more difficult than it would seem until one has had some experience. The trouble is that when a mistake is made there is no possible way of knowing it. We found some missionaries once keeping Tuesday for Sunday.

The Diau with a Parikutu companion took us ten days by canoe to his village and then sent us two days across country to the dance at the last village on the Brazilian side of the divide. The Parikutu was glad of the opportunity to visit the Diaus and to see the other people who were attending the dance because he wished a wife and hoped to find some young woman who would be willing to share his fortunes. It would be necessary for him to remain a long time because he was a stranger, so he made no arrangements for returning. Our own Taruma boy found a Waiwai girl he had known before and contracted to return for her, when he got home from our journey. I have since learned that he kept his promise. Intertribal relations were much improved no doubt by our passage through the country. Our four boys went all the way and from village to village we took a large party of men and women, but there was no misconduct on the part of anyone. We never wit-



Waiwai Pig Trap.

nessed an impropriety of any kind whatsoever. We had no difficulty with the men, nor did they have any among themselves. There was no evidence of anger or resentment. We never saw a child punished nor even one that needed it. The perfect obedience of children is probably due to the custom of separation of the sexes. The small boys always eat and associate with the men. They hear everything that is talked about and soon learn the things they are expected to do. They work, travel and hunt with the men but have very little in common with the girls and women. After the men have eaten at their end of the house the remaining food is carried to the women's sections, where the girls, women and dogs finish it. The girls soon learn from their mothers all their household duties and by the time they are eleven they are ready to take care of their own houses.

When we were ready to leave the Parikutu village, the chief directed his men to fill our canoes with sugar cane for the voyage. Their cassava was not sufficiently matured to make good bread and they were practically living on cane. It is splendid food but it requires a lot of chewing and pressing. The second day our jaws were so sore we could hardly press out the juice at all, the third they were worse and we had to content ourselves with sucking the stalks. Then we learned to twist the stalks and thus press out the juice but that was a wasteful method. Our muscles soon adapted themselves to the demands made upon them, but we had to put in an eight hour day chewing in order to get sufficient food. While we were living at the village the chief furnished us food but would not accept pay for it. When we carried food away with us he took pay—the same kind of hospitality that we observe. This was true in other tribes as well. Our own boys went hunting and fishing with others of the village and often worked with them in clearing and planting the fields. We soon learned the kind of things the people cared most for, such as machetes, knives, etc., and traded those for labor only. They would accept anything for food, but we had to give the same kind of thing to everyone for the same kind of food. We had difficulty in trading one thing for two or two for one. If we gave one man a knife for a journey another man would expect a knife for a journey no matter if one required three days and the other ten. The length of time was of no consequence. On the way we got little game or fish but a great deal of good fruit, the abiu (*Lucuma lasiocarpa*). The south bank of the river reminded one somewhat of a vast lemon orchard when all the fruit is ripe. The fruit trees grew very high and spread their branches, now yellow with ripe fruit, over the other tree tops. As we had no time to pick the fruit or to fell the trees the boys climbed the trees and cut off the limbs. The fruit was about the size and color of a lemon, with a thin skin and soft juicy pulp. We often got a bushel from a single tree and practically lived on this fruit and our sugar cane for the week we were in the region.

The Parikutu village, Miñaiulud, was the highest point reached on the Apiniwau, Lat. 1° 23′ N., Long. 57° 8′ W., elevation 600 feet. A few miles below the village the Ocura rapids made it necessary to unload our canoes and to carry everything over the rocks to the water below. We were accustomed already to this kind of work and little time was wasted. Our packs were arranged for this kind of travel, and while some were looking for a passage for the canoes the others were unloading and carrying the packs below. Great care was required in handling the canoes because the bark would split very easily even when new, but after several days dragging over sharp rocks the bottoms became so thin they would hardly bear their own weight. When they were new one might stand up in the bottom, if he had the nerve to do so and look for a passageway as he floated down the rapids but the bark was soon so brittle that one could not step into the canoe.

At the foot of the rapids the Kamuau or Sun River enters from the north and looking up stream we could see rapids which correspond to the ones we had just passed. Judging from the volume of water and the direction of the course of the Kamuau, the distance from the divide must be greater than formerly supposed. A short distance below the Kamuau we were compelled to unload again at the Kambaitabu rapids. From here to the mouth of the Honawau the current was strong, but we were able to shoot all the short rapids without unloading. From the long curves of the river we could see many round-topped mountains and to the northeast the low range extending from northwest to southeast, where it ended in a high peak at the mouth of the Honawau. The elevation here was 460 feet, Lat. 1° 8′ N., Long. 56° 41′ W. Below the river is called

Kaphu by the Diaus. They say a large river enters from the west four days below at a place where there are great falls. No Indians ever go below because they cannot pass these falls. They say there are no more Indians on the river, which means that there is a long series of rapids and no means of communication with the people on the lower Trombetas.

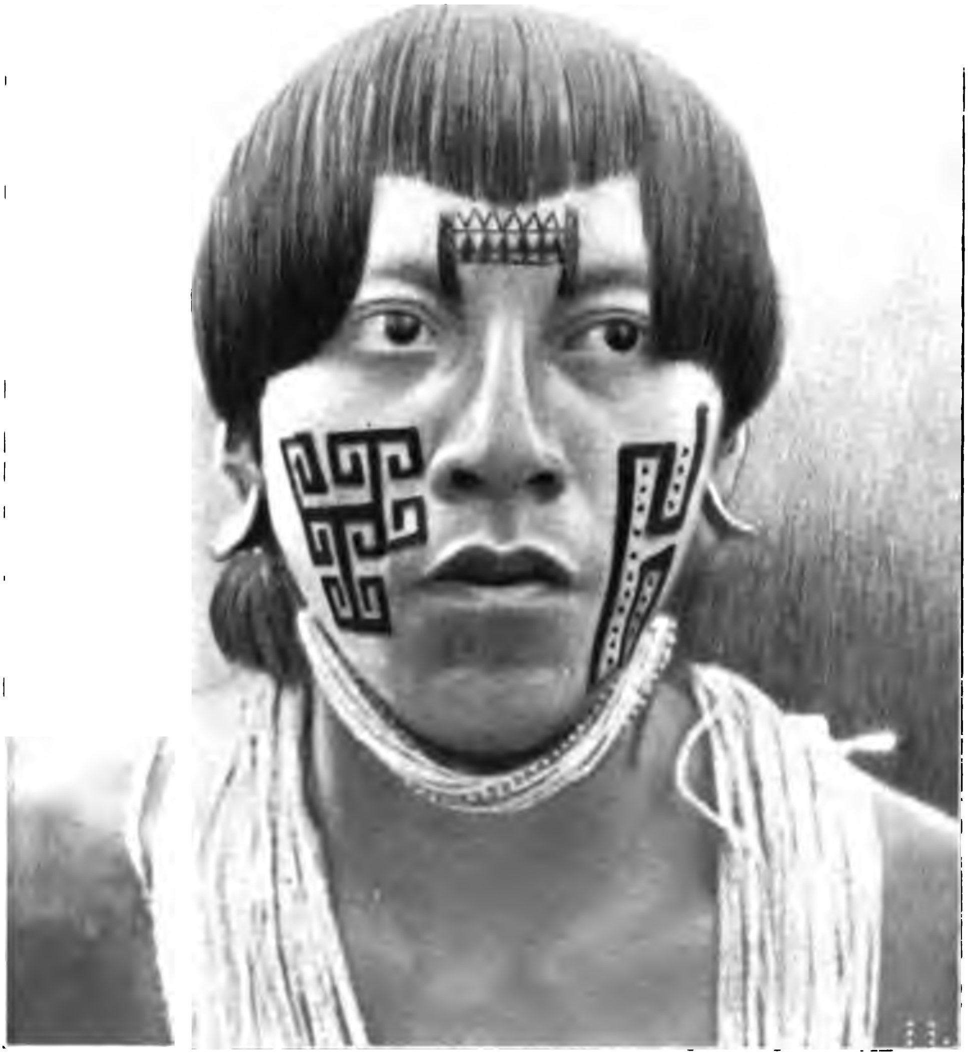
We were deceived by the breadth of the Honawau where it joined the Apiniwau. The two rivers were about the same size, or 1,000 feet across. As we ascended the Honawau we soon reached higher land where the river was more rapid and had less width. The first night we camped on some rocks which were covered with petroglyphs. We found them in three other places along the river. These pictures of men and animals carved to the depth of 5 mm. in granite rocks occur along many rivers in the northern part of South America. As none of the present peoples make glyphs or know anything about their origin or significance, they must have been made by former occupants of the region. They are interesting to us because they are the only evidence remaining of an extinct culture and represent the first efforts towards artistic presentation.

The river flows almost due south with no curves long enough to give us a view of distant mountains but the numerous small, rapid streams entering from the east led us to believe that it was not far to the high range we had seen from Mount Paiufon. Most of the rivers bear animal, plant or fruit names and hence they have as many names as there are Indian dialects spoken in the region. We used Wapisiana in all our conversation and thus gave the names in that language. In all the languages the name river or mountain is added to the proper name; as, *wau* and *taua* in Wapisiana. For this reason I have not used the English equivalent after the native name. We have many river rivers and mountain mountains all over the world, just as we have I-don't-know rivers, mountains, animals and things everywhere.

The higher up the river we got the less rapid and more winding it became. There was no place for a village along the upper river until we reached the head of canoe navigation because the land is too flat. At the end of the rapid water there is a new clearing with some unoccupied shelters, but the cane and cassava were not old enough to use. Just above the Haitapi rapids we turned into the Iliau and soon came to the first Diau village, consisting of three large houses. All the younger men and women had gone to the dance at Chalifono, a day's journey on foot to the northward. We had had ten days of hard work with some fever, so we took the advantage of a quiet place for a day of rest. We could have reached the dance easily enough in one day but the new Indians were anxious to see us use our guns and we spent some time hunting. It was well worth while; besides needing the food it was desirable to have the Indians appreciate the value of firearms. There was never the slightest danger of trouble with them after they had witnessed the killing power of powder and ball.

Chalifono, the last village on the Brazilian side, is in Lat. 1° 50′, Long. 56° 42′ W., with an elevation of about 600 feet. The dance had been in progress two weeks and the food was nearly exhausted. Representatives of several tribes were present. They were tired dancing and were the more ready to take an interest in us. The manner of our reception here was practically the same as in all the villages. We marched in single file and lined up in front of the men's door of the large house where we remained standing until the chief came out bringing stools, for himself and us. We would then sit down facing each other and engage in conversation. The chief would talk for 15 minutes without hesitation and then suddenly stop for me to reply. Neither of us knew a word the other said yet we understood each other perfectly. After all the men and boys had thus greeted us the women and girls came in line, headed by the chief's wives. Each offered a world of welcome and passed on without waiting for reply. This was not a special reception for us because we were strangers.

Then general conversation was indulged in until the women brought food and drink and set before us. We would then surround the great cooking pots filled with soup and boiled meat, squat on our heels and each take a large piece of cassava bread, soak it in the soup and move back without rising to make room for others. When we had eaten the moistened part we would move up again. If we cared for meat we fished it out of the soup with our fingers. It is the custom for each one to carry away a part of any bread, fruit or nuts left over and it is considered very bad manners not to do so. It was difficult for us at first to know what to do but our men often



The Characteristic Face Painting of the Waiwes.

prevented us from making blunders by calling our attention before it was too late. We did not like some of their drinks yet when the chief brought them we had to accept them and drink all he offered. If someone else brought it we might take a little and pass it on but the empty bowl had to return by the same route to the one who brought it. A person who is polite at home soon learns the proper etiquette abroad. To make intoxicating drinks the girls chew cassava in order to mix the saliva with the drink and start fermentation. They scrape the tongue before beginning to chew and saturate it with wild honey. The ones selected for this purpose are marked with tattoo lines about the mouth. Fortunately the traveler learns to like the drink before he sees it prepared. The taste acquired, it doesn't matter, he must drink it. As soon as we had finished our meal we were taken to the men's house and our hammocks arranged for a rest. Towards evening the chief came to take us to the river for a bath. No better entertainment could possibly be arranged for a traveler's comfort.

Here I had the usual difficulty in getting language without an interpreter. To one who has not had experience it would seem very easy to get the names of everything by pointing at them or touching them. A boy is the best person for this kind of work because he is free. When you get his confidence he catches on quickly and will tell you everything. After he sees you write down a few things, he will give you the name and wait for you to write it. If he says he does not know and you begin to write it down as the name, he will stop you, then if you are as bright as he is you will understand. A worker always tries out the words with another boy in order to be sure of the pronunciation. If you do not get it right he will correct you. The name dog is the one word that every one gets. Dogs are always present to be pointed at. In one village when I tried the name with another person, he shook his head and gave me another name and I wrote that down. I tried again and again, getting a different name each time. Then it suddenly dawned upon me that I had been getting the individual names of all the dogs in the place.

Their dances were largely mimetic, in which all the animals and events connected with their daily lives were imitated. Hunting scenes, jaguars chasing a herd of peccaries, vultures eating dead animals, etc., all so well done that we understood perfectly without an interpreter. Before the dance some interesting wrestling matches took place. They seemed somewhat in the nature of initiation ceremonies. Neither we nor our four men were asked to take part but the Parikutu who came with us was the first to be selected. He and one of the men of the village came out into the sacred place, each carrying a good strong whip. At a given signal they attacked each other with their whips, making them crack like pistols about their bare legs. When they could stand the punishment no longer they dropped their whips and rushed at each other like mad. It was the regular catch-as-catch-can contest but instead of trying to throw each other down they tried to lift each other up. The one who first succeeded in getting both the other's feet off the ground at the same time was declared the winner. I should like to recommend this form of contest to our athletes, not as a substitute but as a valuable addition to the list of exercises. It introduces new tactics. Try it.

When the dance was over or rather when the food was exhausted, we started home with an old trader who lived twenty-eight days to the northeast of this village. He had never seen whites before but knew some negroes who came up a river every year to trade with his people. He was an accomplished linguist and knew several Indian languages. All of these he tried on us and then to our surprise he used some English, French and Portuguese words which he had learned without knowing their meaning. No doubt, he had met British Guiana negroes working balata in French Guiana, who had tried him with these languages in an attempt to communicate with him. He and his people had been drinking and dancing until they were so nearly exhausted that they traveled very slowly. We were in the habit of walking fast until we encountered game or until afternoon when we would camp and go hunting. The second evening they got into camp late. In the morning when we were ready to start he refused to move, saying that we had traveled so fast the day before that his soul had not been able to keep the pace and that he would have to wait until it caught up. About eleven o'clock it came in and we got away but it was so tired we made a very short journey. The fifth day his wife or, one of his wives took fever and he decided to camp for a time at an old field until she recovered. We were having fever also and decided that we must not remain with him longer. Our stock of quinine was exhausted and our ammunition was getting low so we determined to take the shortest way out to civilization.

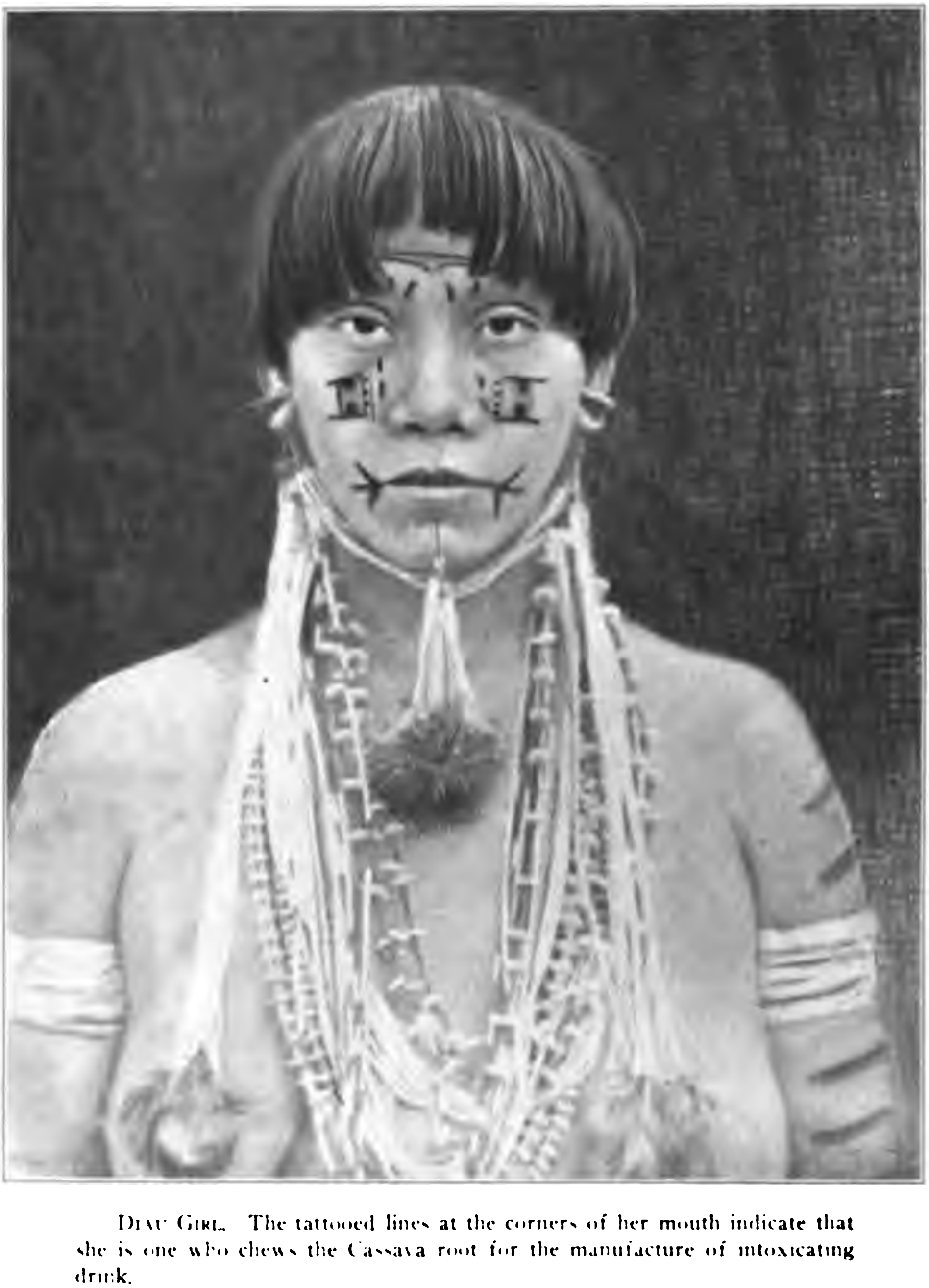
The second day from the village we crossed the low watershed between the Corentyne and the Amazon at an elevation of seven hundred feet in Lat. 1° 55′ N. and Long. 56° 45′ W. The old trader had told us of a great open space in the forest on this high ground and we thought he meant a lake but when we reached it we discovered an outcrop of granite a quarter of a mile across. This is on top of the divide and, no doubt when the delimitations are finally made, it will be fixed to mark the corner in the boundaries between British Guiana and Brazil and between the Guianas; as Ogilvie and I were the first whites to cross the divide at this point we named it Farogle. The elevation of the divide above the canoe stations on either side is not more than one hundred feet. I shall never forget that day we crossed over—it was the day of my first attack of fever. About eight o'clock in the morning, as we were coming over some rough trail, the fever came on with severe chills. As I walked along carrying a pack my teeth chattered until one should have thought I was crossing the Andes and suffering from cold and siroche.

We camped on a small stream which was flowing north. As usual when crossing a stream we asked the trader where it went. He replied that it went on in that direction and never came back. That it flowed into a river so large that the parrots and eagles could not fly across it; that its water was so thick that a canoe could not be paddled in it until nearly noon. When we asked him if he had ever seen the river, he said, " No, all the rivers I ever saw had another side to them but this one has no other side." We told him that we lived on the other side of that great river. He could easily believe it, because no Indian had ever seen whites before, hence they must live in some out-of-the-way place. In two days we made two large woodskins and started for his great river.

We were not certain what river we were on but knew that it must be a very rapid one, because our elevation was six hundred feet and we were in latitude 2° N., with only 4° to go. On the Amazon at the same elevation one would be three thousand miles from the sea. We knew our latitude all the time but could not work out our longitude for want of tables. I carried a sextant and artificial horizon and worked with the stars every night. This attracted the attention of the Indians and I was able to get much in the way of star lore that I should have missed otherwise. Along the inhabited rivers among the rubber men and traders we were given credit for great wisdom because we knew the stars and could calculate our position from them. Our latitudes on our map are accurate but the longitudes are only approximates. At both ends, I tied up with established astronomical positions. The position of Dada Nawa was fixed by H. P. C. Melville and C. W. Anderson, and that of the mouth of the New River by Anderson and Dutch explorers. On the way we made many long halts which allowed me to take observations several days apart at the same station and get a rate for my time. On the rivers I made a traverse with watch and compass and checked it with astronomical observations. While the map is far from being perfect it is fairly certain that it will not be improved upon for another generation.

I have already spoken of some mistakes of other maps. There are a few others to be mentioned. British maps as late as 1910 show the Corentyne River flowing due west for fifteen miles to join the New River which is flowing northwest. The New is represented as the larger river, and its course continued by the Corentyne for ten miles. If a straight line were drawn from Cutari landing to the Wanotobo cataract, the last of the great rapids, it would at no place be ten miles from the river. It would practically follow the river to Lat. 2° 55′, cross at King William IV cataract and continue on the west to the Wanotobo. The New River enters from the west at a point where the Corentyne has just changed its course to a little east of north and this course is continued for fifteen miles or to the mouth of the Lucie River. The Corentyne is the larger river. The Dutch use the name Corentyne only to the junction of the New River, then call the upper river Coeroene. The Indians say the Sipaliwini is the longest branch; if so, its source would be considered the source of the Corentyne and hence it would be the boundary river. I should like to recommend that the British Guiana boundaries be established before the territory becomes more valuable.

Schomburgk, who descended the Apiniwau in 1843, must have ascended the Honawau, but he gives it another name. He notes only



DIAU GIRL. The tattooed lines at the corners of her mouth indicate that she is one who chews the Cassava root for the manufacture of intoxicating drink.

a few of the numerous branches of the river and they all bear different names from ours. He speaks of petroglyphs, which are probably the same as the ones we recorded. He mentions the different tribes of Indians he encountered, but none of them are found today in the same region. He crossed the divide by another trail and probably took canoes at a point lower down on the Cutari. C. B. Brown explored the New River in 1871 and after he had returned to the Corentyne went up that river for several days' journey but did not reach its source. More recently C. W. Anderson and others have gone up the Corentyne to the mouth of the New River. The Dutch have explored the Sipaliwini to its source.

Ogilvie is an expert gold prospector and panned all the streams we passed but did not get a single color in any one of them. The rock formation in all the Brazilian area is granitic. Along the larger rivers there are great granite boulders standing out in the middle or along the banks. These are very often split vertically or horizontally. The separated parts may be near together or at a distance of a few feet. A rounded boulder, fifteen feet across, standing ten feet out of the water, may have a horizontal crevice six feet from the top and the top part may be shifted a few feet to one side, or even in some cases the top may be seen turned upside down, lying near its base. Again scales six inches thick may be loosened and slide down into the water. One night we heard a great noise, which sounded like the explosion of tons of dynamite at the distance of a few miles. These sounds have been reported from the whole north Brazil and southern Guiana region and have been attributed to falling trees, to bursting of trunks of large palm trees, and to explosions of falling meteors. None of these are at all satisfactory. It is a different kind of noise from that of a falling tree; no one ever saw such bursted palm trunks, and they are too numerous for meteorites. The bursting rocks furnish the most plausible explanation. The geologist can easily explain why the rocks should split in this fashion. The Indians say Amarad, nature, does it.

Where we embarked for our long, lonely journey the river was very narrow, but fortunately there were no logs to cut. It had rained for two days and the river was so swollen the sandbars were covered. We paddled down the short turns with a four-mile current for three days before we reached the first rapids. On the way the river had received two small rivers and many streams which made it now a good sized river. Where there are rapids the river breaks up into many branches forming islands of various sizes in the midst of the rapids. It is impossible to tell which way to go, because the bottom of the falls cannot be seen. We started down among the islands, making our way as best we could from one to the other until we were far away from the mainland on either side. We could not catch fish in the rapids and there was no game on the island, so we had to spend a supperless night. For the first time we began to realize how helpless we would be if we should lose our canoes on an island. It would be impossible to reach the mainland or to get food where we were. We decided to remain near one bank or the other. When we heard the noise of the rapids below, we stopped on the first islands at the top of the rapids and from the noise of the water decided which bank to follow, always keeping as far away from the noise as possible. It was best to take the longer way around and thus avoid the greater falls. Often the rapids were very long and it was impossible to tell which way to go. We could only guess from the general direction of the river. Rapid rivers seldom make long detours. The branch we followed would continue to break up until it might disappear among the rocks when we would cut a trail across an island or a point of the mainland for a long distance to another branch and try it again. Scores of times we carried our canoes across long level stretches or over high rocks and steep banks. The forests were so dense that we could cut only very narrow trails. On this account we turned our canoes upside down and carried them over our heads. Some one was always sick with fever and at such times he would remain in his hammock until the trail was ready. Then he would get up and take his place in the line because it required our combined strength to carry the water-soaked canoes. One might be too sick to paddle but he could not be too sick to pack. Not one of us will ever forget these trying times.

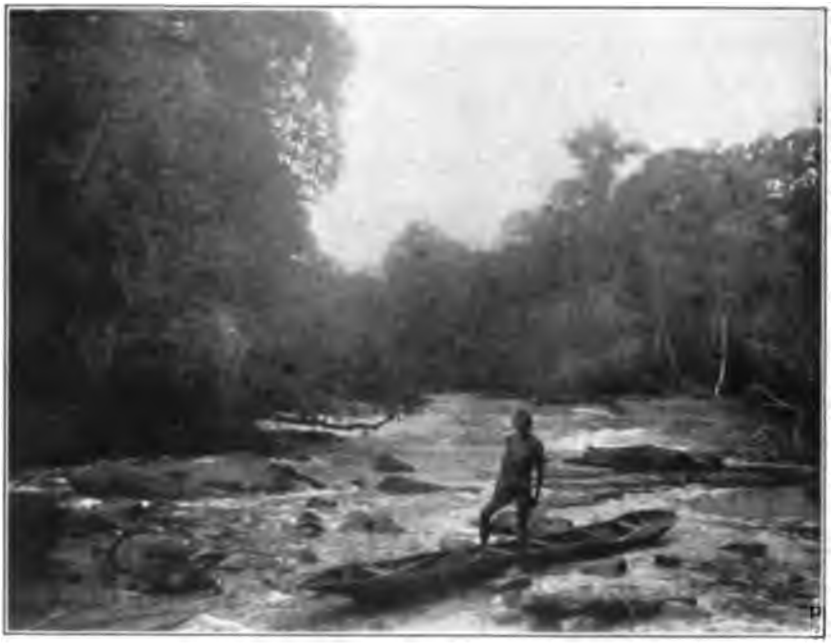
Between the rapids the banks of the upper river are high and lined with heavy forests of hard wood. There is nothing of the jungle one gets in the lowlands. The Brazil nut is found but is not common on the Corentyne. The sapucaia nut (*Lecythis ollaria*) is also rare. The balata (*Mimusops globosa*) is found in abundance about the Wantobo cataract and for some distance above. The mora (*Dimorphandra mora*), the greenheart (*Nectandra Rodivei*) and its two relatives, purpleheart and redheart, are all found below the mouth of the Lucie River in abundance. They are all hard woods too heavy to float and all good for railway ties or submerged work, as piles or wharves. They resist the teredo. The mora grows near the river, while the others grow on higher land. The purpleheart is very noticeable because it is the tallest tree in the forest. Its bark is used for woodskins. Crabwood (*Carapra guyanensis*), which is used on the lower river to make furniture, grows on lowlands. The red variety resembles mahogany. None of these trees except the first two are found on the Brazilian side. The most beautiful and most conspicuous of all the upper river trees is the lilac (*Jacaranda filicifolia*). It sheds its leaves and the pale lilac flowers soon make their appearance upon the bare whitish branches. The silk cotton tree (*Bombax ceiba*) with its massive buttress is characterized by the huge spread of its horizontal branches. When its seed pod bursts the surrounding vegetation is covered with a soft down. The country is not as hilly as it is on the Brazilian side. Occasionally at a turn of the river we would get a glimpse of a low hill in the distance. There is nothing like a chain of mountains until the region of the mouth of the New River is reached. This upper country would be a splendid place to colonize if there were railway transportation.

For twenty-six days we worked our way down this difficult and dangerous river without seeing a single human being on the way. As in the days of Schomburgk there are no Indians living along the banks of the river. When we reached the last, or the Wanotobo Falls, we attempted to go down on the British side, but were unable to do so and spent four days working our way across the falls to the Dutch mainland. The last two we were without food. In the evening Ogilvie shot an alligator and we went into camp on what later proved to be the bank of the river. We were so hungry that we ate too much and in the night all were sick. I was restless and sat up in his hammock. Ogilvie laughed and asked what was wrong. I said I was sitting up to keep my alligator down. He replied that he had just been down to the river to throw his up.

The past four days had been the most exhausting of the whole journey. When we reached the top of the "Great Falls" we had the feeling one has when standing on the edge of a great mesa. We could look down over the great sea of green stretching northward as far as the eye could reach but no river was in sight. The tumbling waters were so noisy in every direction that we could get no idea of which might be the best of the numerous branches to follow. We attempted the British side because it was nearer. Our canoes were so fragile from the constant dragging over the rocks that we had to exercise great care lest they should be broken to pieces. They were split in scores of places and calked with scraped bark or old clothes. One was kept busy baling while the other two paddled. We had been looking for a tree with bark suitable for canoes for days but could find none. Our condition was becoming serious indeed. If we should be cast upon an island we should starve. No one could swim in that rapid water. Ogilvie for the first time became discouraged—it was at night after a hard day working over the rocks with a raging fever and without food. My first time had come a few days earlier under similar circumstances. But in both cases the depression disappeared along with the fever and daylight found us looking for a passage and grub—or grubs.

The branch we had been following divided and the water disappeared among the rocks. The men went ahead to look for a possible passage but could find none. They did find however something much more important—a trail which led to the foot of the falls where to our great joy we found two large canoes with oars. We knew at once there were no more serious rapids, for such boats could not be handled in rapid water. They belonged to men who had gone deep into the forest to bleed balata. Taking along one man with a section of alligator tail for food I attempted to find them and get permission to use one of the boats, but after following their trail for two days without success I returned. The men had not been able to find suitable trees for woodskins. There was nothing else to do. We took a boat, hoping to return it before the owners might need it. Next to murder, taking a boat is the most serious crime one can commit and is punished accordingly by the Dutch authorities.

About noon we met some negroes going up to the foot of the falls to work rubber. They told us that a government launch was



A Woodskin, or Bark Canoe, on one of the Numerous Branches of a Rapid in the Coventine.

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expected within a few days at the Dutch station a short distance down river. We hired them to take us down to the station and to return the boat. We did not like the idea of falling into the hands of the authorities with the boat still in our possession. By traveling two days and the intervening night we reached the station in time to hear the whistle of the approaching launch.

Here we had time to take stock of our possessions and condition. Our reserve food supply consisted of the fore leg and a part of the tail of our old alligator. He had furnished us food for three days. This the good negro host immediately threw away, saying that no man should eat such food as long as he had rice and beans—a sentiment that one cannot fully appreciate until he has lived on alligator steak alone for several days. Physically we were all in a very bad condition. For two months we had had chills and fever continually. This, together with poor food or the lack of it, had reduced us to skeletons. I was forty-eight pounds lighter than when I started on the expedition. One of the Indians had dysentery and all were suffering from sore feet. Ogilvie had "Bush Yaws" which kept him in the doctor's care for many months, while I had beri-beri, according to the diagnosis of the natives. They pressed their fingers into my swollen feet and legs making deep dimples which would remain for a long time. They said I would get to Georgetown all right, but no one ever recovered. I was not alarmed, because I knew I was suffering from cold feet only. I had not been accustomed to work in water barefooted. The water was much colder than the air while the rocks over which we carried the canoes were very hot. Eight months afterwards I was able to lace my shoes again.

When we arrived at Nickerie, at the mouth of the river, we were taken in charge by two police officers carrying rifles, who marched us through the city in a downpour of rain, to the police station, where we were detained for three hours, while the court examined our papers and the curious populace observed our ragged clothes and bare feet. I was having fever at the time and wore my army blanket to keep warm and to protect me from the rain. The amount of our letter of credit impressed the judge favorably and we were allowed to cross to the British side of the river at Springlands. We could not understand just why they put us under arrest and compelled us to visit the police court. No explanation was made and no apologies offered when we were dismissed. There is a very strict police control of the river on account of rubber contractors occasionally escaping with their advances. We had taken a boat but it had been returned with the approval of a member of the police patrol. Apparently we had no satisfactory explanation for being in the country. The only paper I carried was my letter of credit. As we had Brazilian bills and English gold, they knew we came from Brazil. The discussion continued until every prominent man in the city had been sent for and had had his say about the matter and until every one of the collected mob had had his look. One is not likely to enjoy such attentions with a body temperature of 104°.

At Springlands we hired an automobile for a night ride of forty-five miles to New Amsterdam where we got a train for Georgetown. We had been just eight months away from postal touch with the outside world at Boa Vista. For five months we had not seen another white man. When we arrived at the railway station we took a closed carriage to a men's furnishing place known to Ogilvie. When we entered, the proprietor said: "You have made a mistake, the man who buys old rags and bones is next door." We were declared to be the toughest looking men who had ever entered the city. However, we were very kindly received and entertained by the Governor of the colony and other friends of Ogilvie and Melville. After ten days' rest and much needed medical attention, Ogilvie and our four faithful Indians set out for the long month of upriver canoe travel to reach their homes in the savannah country. Whatever success we attained was due to the perfectly harmonious labors of the entire party. Ogilvie, with his fourteen years' experience in river and forest exploration, was of inestimable value to the expedition. He is the best man I ever saw for such work. Every one of the Indians we selected proved himself worthy of the confidence we placed in him. Their knowledge of Indians and their common customs prevented our making mistakes and secured the confidence of the numerous tribes we visited. They knew how to get food in the forest and where to look for it. I was constantly surprised at the number and variety of things they knew. None of them had ever been in the region before but when we were descending the Corentyne they told us many times quite accurately what places were directly west of us on the Rupununi and Essequibo, and how many days' journey it would be if there were a trail. They have an excellent sense of location. The two younger men had never been away from home before and it was interesting to see how they reacted in their new experiences. Neither had ever worn clothing. Neither had seen anything larger than a canoe. We took them first aboard a steam launch, then a motor boat; next we put them in an automobile for a wild night ride, then on a steam train to the city, where we dressed them up in new clothes and through it all they showed no sign of fear, surprise nor delight, neither did they seem awkward in their first suits. This does not mean that they were stupid, unimpressed and uninterested. It is only an example of their complete self-control. We could overhear them talking quietly about what made the thing go and how fast it went, etc. They observed everything but without demonstration.

From Georgetown I went by way of Trinidad to Barbados where I had the pleasure of spending a day with Colonel Roosevelt and learning from him the story of his explorations in Brazil. After remaining in Barbados twenty-five days and putting on twenty-three pounds of good, solid flesh, I returned to Para for another journey.

GEOGRAPHIC NEWS AND NOTES.

Geography and the National Research Council.—Geography has been recognized as one of the coördinate branches of science by the National Research Council and the following Geography Committee has been appointed: W. M. Davis, Cambridge, chairman; L. A. Bauer, Washington; A. P. Brigham, Hamilton; A. H. Brooks, Washington; H. C. Cowles, Chicago; J. F. Hayford, Evanston; D. W. Johnson, New York; H. F. Reid, Baltimore; J. Russell Smith, Philadelphia; R. DeC. Ward, Cambridge. The duties of this committee are (1) To join with the Census Committee of the National Research Council in preparation of a national census of research in geography. (2) To indicate opportunities for geographical research. (3) To survey economic and industrial problems in the United States and to suggest means of solving them by geographical research. (4) To act in coöperation with the Military Committee in solving problems of national defense. (5) To promote national and international coöperation in geographical research. (6) To coöperate with various local committees on research now in process of organization in leading educational institutions. (7) To serve as a national clearing house for information on geographical research. (8) To promote geographical research in any other advisable method.

The Geography of France.—Dr. Raoul Blanchard, professor of geography at the University of Grenoble, who is exchange professor at Harvard, recently delivered a series of lectures on the geography of French cities. He is also lecturing on the geography of the French Alps and geographic factors in the Great War.

Hayden Memorial Medal.—The Hayden Memorial Geological Medal offered every three years by the Academy of Natural Sciences of Philadelphia has this year been awarded to Prof. William Morris Davis, emeritus professor of geology at Harvard.

Record Exports of Beef from River Plate.—The exports of frozen beef from Argentine and Uruguayan packing houses reached a record figure in 1916, while the exports of mutton were less than in any year in the last five-year period. The Revista Financiera y Comercial of Buenos Aires in its issue of January 20 reviews the meat trade of the River Plate, and finds that the shipments of chilled and frozen beef in 1916 were 47 per cent. more than in the last normal year, 1913. A large part of this increase in the production of beef on both sides of the River Plate comes from the packing houses owned by United States packers. One Chicago firm alone has shipped from its South American plants nearly a third of the beef exported, and it is estimated that 55 per cent. of the exports of beef from the River Plate originated in American-owned "frigorificos."

To Siberia via Kara Sea.—Recent developments in the use of the Kara Sea route to Siberia is discussed in a recent issue (February 19) of *Commerce Reports*. The development of the northern route to Europe has long been of great interest to Siberia and has assumed special importance since the war has closed the Baltic ports and caused a congestion of goods at Archangel and Vladivostok. The season of 1916 was the fifth in which the ships of the Siberian Steamship, Manufacturing & Trading Co. have succeeded in overcoming the ice and other difficulties of navigation in the Kara Sea. It may therefore be said that the possibility of maintaining annual sailings by this route has been demonstrated.

From the central districts of Siberia the railway route—either westward to the Baltic or eastward to the Pacific—is too long to permit of the export even of butter and other agricultural products. The transport of grain, for instance, from the Yenisei Province to the Baltic, a distance of about 2,750 miles, costs more than the grain itself. These districts, however, possess in the Yenisei River and its tributaries a system of waterways which are available for the transport of goods at comparatively small cost. The drainage basin of the Yenisei and its tributaries has an area of approximately 970,000 square miles. River steamers can run on the main stream from Minussinsk, near the Mongolian border, to the Arctic Ocean, a distance of about 1,500 miles. The principal tributary is the Angara, which issues from Lake Baikal. The construction of locks to overcome some of the rapids would render possible the transport of goods from northeastern Mongolia down the Selenga to Lake Baikal, and thence to the Arctic.

All the chief tributaries of the Yenisei River flow from the east. Draining the territory to the west is another great system of natural waterways—the Ob. This river with its tributary, the Irtish, serves a large area, stretching from the Altai Mountains to the Arctic Ocean, and comprising some of the richest districts in Siberia. The navigation of the Ob and Irtish Rivers is comparatively easy over great distances.

All navigation in the Arctic Ocean has to contend with the ice. The estuaries of the Ob and Yenisei Rivers are comparatively close together, being separated by only a narrow peninsula. In order to reach the mouths of these rivers from western Europe it is necessary to sail through the Kara Sea, a landlocked body of water separating the island of Nova Zembla from the mainland and open only toward the north. This sea may be entered from the west through one of three narrow straits: Yugor Strait, between the island of Vaigach and the mainland; Kara Strait, the broadest of the three, between the islands of Vaigach and Nova Zembla; and the Strait of Matochkin Shar, separating the two parts of the island of Nova Zembla. A considerable quantity of ice is formed each winter in the Kara Sea which breaks up and melts during the following summer, thus creating conditions difficult to navigation. These conditions, however, are liable to great variation from year to year. According to Dr. Nansen, the distinguished Norwegian explorer, who has carefully studied this question, only small quantities of ice drift into the Kara Sea from the north, since this body of water is too landlocked and shallow to permit of extensive ice movements. The amount of ice adrift each year must therefore depend on the quantity formed during the preceding winter in the sea itself. This quantity may be determined by systematic observation and investigation of conditions governing the formation of ice. It is therefore thought possible that with proper regulation the navigation of the Kara Sea may be rendered possible for at least five to eight weeks every year.

To overcome the difficulties of navigation in the Kara Sea the Russian government has established three wireless stations in this region, which can inform vessels as to ice conditions. Two of these stations command the two straits south of Nova Zembla that give entrance to the Kara Sea, while the third is situated at Mara Sale on the Yamal Peninsula at the eastern side of the Kara Sea. It is proposed to equip these wireless stations with seaplanes with which to investigate the state of the sea and the direction in which the ice is moving. The construction of lighthouses, landmarks, and an adequate harbor in the northern part of the Yenisei to facilitate the exchange of cargoes between steamers and lighters is also being considered. These measures will greatly diminish the difficulties of navigation and should result in lowering the insurance rates on goods shipped by the Kara Sea route.

In 1916 one steamer only was used by the company, owing to the difficulty of obtaining export licenses in the case of both inward and outward cargoes. Foreign goods amounting to 2,500 tons were shipped into Siberia and about 1,100 tons of Siberian produce were exported. The inward cargo was made up largely of goods of British origin and consisted of machinery, tools, wire rope, bags, groceries, paints, tin, tinplates, etc. The company proposes to send a much larger expedition in 1917, consisting of at least three steamers, with a minimum carrying capacity of 10,000 tons.

The Amazon in Flood and in Dry Season.—The following contrast of the aspects of the Amazon at different seasons is given by J. F. Woodruffe in a new book on The Rubber Industry of the Amazon: "During the dry season the high banks become covered with a luxurious growth of vegetation, including beautiful flowers, and as the bed of the river appears, sand-banks many miles in length are formed, which furnish breeding grounds for numberless varieties of river turtle, aquatic birds and alligators, with here and there islands covered with magnificent trees, while every day is bright with sunshine, except for the occasional thunderstorms, accompanied by tropical showers, which in their violence and suddenness, coupled with their extraordinary brevity, are, I am sure, peculiar only to the Amazon or centers similarly situated.

"It is, however, a very different picture that one sees when the rivers are in flood. Sand-banks disappear from view, the sites of many islands can only be distinguished by a few tree-tops, the high banks are no longer apparent, as the mighty rivers not only overflow them, but even cover thousands of square miles of the low-lying forests on either bank, thereby converting them into huge inland lakes and swamps, reminding one of the stories of that vast inland sea which undoubtedly prevailed throughout the center of the South American continent. These lakes soon become the temporary home of alligators and other reptiles, whose calls replace the sweet songs of birds which render the forests so delightful in the dry seasons. During such times the weeks are gray and sad, and the rubber gatherer passes day after day in his hammock without any profitable occupation. Varying these spells of waiting for a lull in the rain, the man watches the rise or fall of the water against the poles of his rough hut to see when he will be able to walk on dry land and so continue his work again. Owing to this it is no uncommon thing for the rubber gatherer and his family to pass several months of the year perched in such a poor habitation, sharing it with his dogs, fowls, and a host of insects, all unable to move far owing to the water that surrounds them."

The Topographic Map.—Professor W. M. Davis, of Harvard, is chairman of the Committee to Expedite the Completion of the Topographic Map of the United States. This committee is making an earnest effort in aid of the Director of the U. S. Geological Survey to persuade Congress not merely to allot the usual sum of $434,000 for topographic surveys, under the Sundry Civil Appropriations Bill, but also to allot $200,000 under the Army Appropriation Bill. At the present rate less than 1 per cent. of the total area is mapped each year, and but 40 per cent. of the national domain has thus far been surveyed. The increased amount would result in a marked acceleration of this necessary work, and letters from members of this Society to members of Congress are solicited. Professor A. E. Burton, Massachusetts Institute of Technology, Cambridge, Mass., is secretary of the Committee and he desires copies of any letters sent.

Stefansson Heard From.—A dispatch from Dawson, Yukon Territory, dated March 9, 1917, says:

"Vilhjalmur Stefansson, the Arctic explorer, is wintering with the gasoline schooner *Polar Bear* at Prince of Wales Strait, according to news brought here to-day by a northwest police expedition from Fort McPherson. The information was brought from Herschel Island to Fort McPherson by Captain Lenauzee, captain of police at Herschel Island, who made the trip of 200 miles alone, with dogs.

"Stefansson, who passed last summer exploring the new land he discovered north of Prince Patrick Island, is hopeful that the ice will break early this spring and permit him to make his way to the north and east and, after accomplishing the northeast passage, sail up the St. Lawrence River to Montreal."

Roald Amundsen's Plans.—Roald Amundsen has definitely postponed the execution of his plans for an expedition to the north pole until after the war, according to *Science*. His ship was almost equipped for the trip, which was to have lasted three or four years, and the crew had been hired; but the money difficulties proved insuperable. The necessary expenses of the expedition in consequence of war prices have mounted from $135,000 to double that figure.

Aëroplaning into New Guinea.—Dr. Eric Mjoeberg, entomological assistant in the Swedish State Museum, is in this country lecturing to obtain funds for an expedition to the interior of New Guinea, for which he has obtained leave of absence for three years. He will use an aëroplane, starting from a small island in Geelwink Bay, at the northwest corner of New Guinea.

The David Livingstone Centenary medal was awarded to Theodore Roosevelt on March 20 by the American Geographical Society. This medal, founded by the Hispanic Society of America, is awarded by the American Geographical Society in recognition of work done in the field of geography in the southern hemisphere. The first recipient of the medal was Sir Douglas Mawson, Colonel Roosevelt being the second explorer so honored.

ACTIVITIES OF THE SOCIETY.

Professor Paul Goode, of the University of Chicago, addressed the Society on "The Causes of the Great War" at the meeting of January 3. He based the economic and commercial supremacy of Great Britain largely on her possessions in coal and iron, found that the low plain extending 6,000 miles eastward from the Pyrenees to the Pacific had played its significant part in making Germany a nation of warriors, and declared that the German physiognomy had remained essentially unaltered for 2,000 years.

Dr. William Curtis Farabee was awarded the Elisha Kent Kane Medal—the highest honor in the gift of the Society—on the evening of January 19, at the hands of President Bryant, for his memorable explorations of three years in the valley of the Amazon. Dr. Farabee gave an absorbing illustrated account of his journeys, five in number, dating from his arrival at Para, at the mouth of the great river, June 23, 1913. Dr. Farabee is curator of the American section of the University of Pennsylvania Museum, and he has made important and valuable additions to its accumulations. His story is published elsewhere in this issue.

Herbert W. Gleason, who is vice-president of the Appalachian Mountain Club, delivered a delightful address on "Scenic Alaska" on the evening of February 7.

A "tramp" of 2,380 miles through Andean regions was the theme of Harry A. Franck's fascinating discourse on the evening of March 7. Mr. Franck is well known as the author of picturesque accounts of solitary vagabondage in all parts of the world.

"Our National Parks" was the timely subject chosen by Robert Sterling Yard, of the National Park Service, who spoke to the Society on the evening of March 17. The fine illustrations intensified the ambition of many of our members to become better acquainted with the natural attractions of their own country.

RECENT ACCESSIONS TO MEMBERSHIP.

Mr. Guilliaem Aertsen, Midvale Steel Co., Nicetown, Pa.
Mr. David Werner Amram, 3824 Spruce St., Philadelphia, Pa.
Mrs. Watson Armbruster, The Normandie, Philadelphia, Pa.

Miss Matilda Baird, 1506 N. 16th St., Philadelphia, Pa.
Miss Anne Hampton Barnes, 1727 Spruce St., Philadelphia, Pa.
Mr. D. Moreau Barringer, Haverford, Pa.
Mr. Frank Battles, 267 S. 19th St., Philadelphia, Pa.
Hon. Dimner Beeber, 705 Land Title Bldg., Philadelphia, Pa.
Miss Alice Bodine, The Stenton, Philadelphia, Pa.
Mr. Amos P. Brown, 20 E. Penn St., Germantown, Pa.
Mr. Henry C. Brown, Merion, Pa.
Miss Martha Bunting, 4302 Chestnut St., Philadelphia, Pa.
Miss Edith Chandlee, 14 Burd Ave., Millbourne, Pa.
Mr. Chas. J. Cohen, 334 S. 21st St., Philadelphia, Pa.
Miss Fanny B. Coleman, 1830 Rittenhouse Square, Philadelphia, Pa.
Mrs. Rebecca M. M. Colfelt, 525 Park Ave., New York, N. Y.
Miss Ella Janette Collisson, 120 E. Stafford St., Germantown, Pa.
Mrs. Chas. B. Coxe, 1604 Locust St., Philadelphia, Pa.
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BOOK REVIEWS.

Northup, George Tyler. *Vespucci Reprints. Texts and Studies,* II–VI. Princeton University Press, 1916.

The volumes contain: Vol. II. The Soderini letter, 1504; facsimile. Vol. III. The Soderini letter, Florence manuscript; facsimile. Vol. IV. The Soderini letter, critical translation. Vol. V. The Mundus Novus or Medici letter. Vol. VI. The Pæsi novamente retrovati 1508; facsimile.

Amerigo Vespucci, to whom the American continent owes its name, is not only one of the most enigmatical figures of history, but also one whose claims have been discussed with increasing fervor by friend and foe. Geographers and historians have in recent years been seeking a means of arriving at the truth, but found themselves handicapped by the fact that Vespucci's writings have as yet not been critically edited. Till this was done on the basis of a careful comparison of the earliest texts from the standpoint of the philology and textual criticism, no further progress could be made.

This Professor Northup, of the University of Toronto, has undertaken to do in the handy little volumes before us. He finds that the three earliest extant forms of the famous Soderini Letter go back to a Spanish original and that there is considerable interdependence. The second volume gives photographic reproduction of the rare form of the Soderini Letter in the Italian print of the early sixteenth century. The translation of the letter in the fourth volume is excellent, representing a bit of constructive work, because it is not based on one of the early texts only, but on all three, variant readings of the texts and reasons for the rendering adopted being given in the notes.

The widely accepted theory that the version of the Italian print, written in the barbaric half-Italian, half-Spanish jargon in the sixteenth century Italian print, is the primitive text is not accepted, despite John Fiske's picturesque explanation that this "Jargon salted with Atlantic brine" would be the natural speech of a man who had spent four years away from his native Florence among the sailors of the Spanish fleet, when he wrote the famous letter.

It would be a satisfaction to have from the editor the results of his investigations on the claims for and against the fellow traveller of Columbus, but this he declines in these volumes, modestly saying, "The wider and more interesting historical questions which it raises must be left to the professional historian for solution."

W. E. Lingelbach.

Bashford, James W. *China, an Interpretation.* Pp. 605, illustrated. New York, The Abington Press, 1916.

The criticism leveled against many books on foreign countries has been that they were written by superficial observers who, after spending a short time among the people of whom they wrote, gave their half-baked impressions as the actual interpretation. This book on China is not open to that criticism. The reader feels that the author's many years of residence, study, and travel in China as Bishop of the Methodist Church in China, combined with a broadness of vision and a sympathetic insight into human character, has enabled him to produce a book of more than usual merit. His interpretation of the Chinese seems eminently fair, penetrating and sound; his conclusions are based upon long and careful observation; his style is clear, forceful and readable. Many of the chapters end with a missionary's statements of conviction as to the value and need of introducing Christianity into China, but even those readers who may not be in sympathy with the missionary movement need not shun the book on this account. One cannot fail to find much fresh information or to appreciate the author's comprehensive knowledge of the Chinese and Chinese affairs.

The chapters treat of many topics: Industrial Life, Commercial Life, Educational Life, Woman's Life in China, Life as reflected in Literature, Life reflected in Chinese Philosophy, Political Life, etc. The concluding chapters give the story of the rise of the Chinese Republic and treat of the relations of China and Japan, and China and the United States. Several appendices follow the main text, giving tables of population, lists of plants furnishing food, Japan's recent demands upon China, an outline of Chinese history, etc. The geographer is glad to see in the opening chapter a recognition and discussion of the physical elements at the basis of Chinese civilization, although he may feel that the treatment is here inadequate and not well organized. While sympathetic and optimistic in tone, the book does not fail to recognize defects in the Chinese character. The book is well worth careful reading by anyone at all interested in the new republic of the Far East.

Franck, Harry A. *Tramping Through Mexico, Guatemala, and Honduras.* Pp. 378, illustrated. New York, The Century Co., 1916. $2.00 net.

There is no better way of seeing a new country and of becoming acquainted with its people than by tramping. The railroad traveler gets only impressions, not knowledge, of the land he sees through the car window, and his stay in the hotels of the cities he visits cannot acquaint him with the real people. An automobile journey can do little more than the railroad journey. It is the pedestrian, leisurely tramping, having opportunity to absorb what he sees, constantly falling in with the people, taking short cuts through the fields and getting off of the beaten tracks, that gets the most accurate conception. This is the method the author of this fascinating book of travel chose for seeing Latin America. Crossing from Texas into Mexico at Laredo, the author traveled in the second-class coaches of the Mexican railroad until he reached the center of the country in the state of Guanajuato.

Here he took to the highway, stopping in the native inns, becoming acquainted with the people, working in Mexican mines, occasionally varying the tramping with a railroad ride, but always in the coaches with the common people. The route followed led into Guadalajara and the Lake Chapata district, to Mexico City, down from the plateau through Orizaba to the Pacific side of the Isthmus of Tehuantepec, thus southward along the narrow coastal plain to San Jose and up to the plateau of Guatemala and across Honduras.

Written in an easy, attractive style, the book is not only entertaining, but it contains much valuable knowledge of the people, their customs, thoughts and characteristics. The reviewer doubts if there is anywhere so vivid a picture of the Mexicon peon and his life in the foreign-owned mines as that given in Chapter III, "In a Mexican Mine." The book is profusely illustrated from photographs made by the author.

Moon, Frederick Franklin. *The Book of Forestry.* Pp. xvii + 315. New York, D. Appleton & Co., 1916. Price $1.75 net.

This book of forestry is written by the professor of forest engineering in the New York State College of Forestry at Syracuse with the desire of stimulating an interest in the forests of America and also to sound a note of warning as to what will happen if the ruthless destruction of our forests is carried on by the coming generation. Many good photographs and figures accompany the text which is divided into two parts. In Part I is told the story of the forest—how it grows, how it is managed, the life of a forester, etc., and an effort has been made to bring out the romance and the charm attached to the forest. At the same time, the attempt is made to give a true picture of methods and conditions which are found in the United States. The more technical part concerning identification of trees and woods has been incorporated in Part II, and here will be found material of interest to the student of nature, as well as the boy scout, who is desirous of learning to know the trees and their woods. The identification of the trees is assisted by figures of the principal species. The Appendix includes a list of general reference books on forestry, and in addition the titles of some good boys' books dealing with the life of a forester, or the lumberman, and describing the drive, etc. This will make further reading along forestry lines possible. The author emphasizes the fact that forestry means using our forests—not locking them up, and that every American, young or old, should realize that our nation cannot long prosper unless it profits by the example of other countries and cares for its non-agricultural, as well as for its fertile, land. The citizen should know that forestry is absolutely necessary, not only because we cannot get along without timber, but because we must by the forest control floods, moderate climate, preserve the channels of our streams and provide recreation grounds for our people.

John W. Harshberger.

Gordon, Winifred. *A Woman in the Balkans.* Pp. xvi + 298, illustrated. New York, Dodd, Mead & Company, 1916. Price $3.50 net.

Those who would gain an intimate insight into the popular life of Serbia, Bulgaria, Roumania, Turkey, Montenegro, Albania, Bosnia and Herzegovina as it was ere war shattered the peace of these lands and destroyed every industry but that of the soldier will do well to follow the vivacious trail of this habituated globe-trotter whose pen is facile and whose sympathies are generous. Mrs. Gordon is too fond of irrelevant asides that drag in contrasts with her previous experiences in other countries, and the English is sometimes slipshod, but her description strikes the human note and holds the interest of the reader. She had the advantage of personal contact with many of the chief actors in the cosmic tragedy now being enacted, and she makes real for us Take Jonescu and Queen Marie of Roumania; Marie's predecessor, the revered "Carmen Sylva"; Nicholas of Montenegro, and many others, exalted or humble, among whom the war has leveled most of the artificial discriminations. It is not "another war book." It is a description of antebellum travel shedding light on the social conditions which are being changed by this tremendous struggle. Good humor is the dominant characteristic of the account, and the author's justified admiration for the heroism of the Serbs and the Montenegrins is strongly in evidence.

F. L. W.

Allen, George H., Whitehead, Henry C., and Chadwick, F. E. *The Great War.* Pp. xxii + 494, illustrated. Philadelphia, George Barrie's Sons, 1916.

This is the second volume of the monumental war history, the first volume of which has already been noticed in the BULLETIN. The theme of the writers is "The Mobilization of the Moral and Physical Forces." It describes, to cite Doctor Allen, "the reaction of human feeling in response to the impression of the momentous events, the nature and force of the opinion of different classes of the population in the countries to which the conflict spread, the spiritual forces which gave vigor and buoyancy to national effort, and the action of these factors in cabinet councils, the elaboration of policy, and parliamentary proceedings." The armies and the naval forces of the belligerents are described. Of the Russian army it is said: "The Russian General Staff and the officers of the army have always been followers of the art of war; they have contributed little to military science. The Russian soldier of the regular army has been patient, sturdy, devout, devoted to the tsar and to Holy Russia. He has been always stubborn, sometimes heroic in defense, but he is handicapped by a lack of intelligence." The wealth of definite fact and of shrewd critical opinion is supplemented by a picture-gallery of variety and timeliness.

F. L. W.

Curran, W. Tees, and Calkins, H. A., B.Sc. *In Canada's Wonderful Northland.* A Story of Eight Months of Travel by Canoe, Motorboat, and Dog-Team on the Northern Rivers and along the New Quebec Coast of Hudson Bay. Pp. xxii + 344. G. P. Putnam's Sons. Price $2.50.

The book is an account of a scientific expedition sent out in the summer of 1912, presumably by the provincial government of Quebec, for the purpose of examining the mineral and agricultural resources, as well as the timber and water power, of the eastern (Quebec) coast of Hudson and James Bays. But let no one think that he will read in this interesting volume a bald record of scientific investigation. Adventure crowds every page. The authors, who were the leaders of the expedition, are both men who love the life of the open for its own sake. They took their lives in their hands daily in the thrilling journey of which they have given us a record simply told and of absorbing interest, illumined with many a flash of humor. The reader travels with the writers, sees what they saw, shares with them their really wonderful adventures along those desolate and storm-beaten shores, and rejoices with them in each escape from imminent peril. The scientific labors of the expedition are never obtruded; but they are there for the discerning reader, to learn, if he cares to do so.

That the results of the investigations of these two engineers will prove ultimately of great value, is clear from a brief summary of their findings, given at the close of the volume. Inexhaustible deposits of iron ore were discovered on certain islands of Hudson Bay. The country east of the Bay is rich in minerals of many varieties, including, probably, diamonds. The water powers of the east coast are among Canada's greatest, and are capable of economic development. Pulp wood is plentiful along James Bay, and this same portion of country is available for agriculture to a surprising degree.

There is a valuable appendix, giving, for the benefit of future travelers, a list in detail of available motorboat harbors along this forbidding coast. The book is also capably indexed.

B. W. Mitchell.

A. C. Lawson. *The Epigene Profiles of the Desert.* Bulletin Department of Geology, University of California, ix, 1915.

All terms employed for the description of natural objects, such as land forms, must be standardized by careful definition before they can be properly used. The standardization of empirical terms, such as hill and valley, is relatively simple and the terms are correspondingly vague. The standardization of explanatory terms, such as superposed river and obsequent fault-line scarp, is a much more elaborate process, as it involves the analytical discussion of the origin of the forms and the systematic arrangement and definition of the terms by which the analyzed forms are named; but terms of this kind have great descriptive power. As a step toward the establishment of several new explanatory terms, Lawson's article above cited deserves careful study: it is one of the best examples of physiographic analysis and one of the most illuminating discussions of desert forms that has appeared in many years. In depth and breadth of grasp it recalls Gilbert's classic discussion of river action in his report on the Henry mountains. The new terms that Lawson proposes are few but significant; they will undoubtedly come into use by geographers of the rational school.

The problem under discussion is the origin of the forms observed in desert regions, where rain, although rare, is sometimes heavy, and where streams wither away in descending courses and fail to unite in rivers that reach the sea. It is shown that if an uplifted mountain mass consist of fine-grained, incoherent rock in a desert region of strong winds, erosion and transportation by wind action will be important; but if the mountain mass consist of hard and coherent rock in a desert region of weak winds, degradation will be accomplished chiefly by temperature changes and gravity, strongly aided by occasional rain wash; and this is believed to be true for the Great Basin region, where wind action is held to be "extremely ineffective" in determining surface form. The deductive reasoning by which the announced conclusions are reached is so close that its logical force cannot be preserved in an abstract. Important among the results is the explanation of the steep "subaërial [rock] front" and the gently sloping "suballuvial [rock] bench" covered by its "alluvial embankment," which occur juxtaposed in various stages of development throughout the Great Basin; of the stripped rock bench or "rock terrace" resulting from "diastrophic or climatic interruption of the normal course of the desert cycle," which Lawson says was erroneously ascribed to "sheet-flood erosion by McGee, but afterwards correctly explained by Paige"; and of the "panfan," a vast alluvial surface developed at the end stage of a desert cycle, actually realized in parts of southern California, and occurring "in various stages of incompletion" as "one of the commonest features of the desert."

The confidence which Lawson feels in the application of deductive methods to physiographic problems may be inferred from his treatment of the steep subaërial rock fronts which so commonly characterize desert ranges. He thus concludes the consideration of their origin: "In this deduction we have the explanation of the observational facts: (1) That the hard-rock slopes of desert ranges which shed large spauls are steep, while those which shed small fragments have a low angle; (2) that ranges composed of hard rocks, which are thus naturally steep, maintain their steepness as long as the rock slopes endure." Here would seem to be the solution of the problem, encountered but not solved by Bornhardt and Passarge in the arid regions of South Africa, of the abrupt transition from steep mountain slopes to thinly covered rock plains. Lawson's adaptation of his general discussion to certain special cases is most ingenious; as in the explanation of convex and concave suballuvial benches; and again in the interpretation of the later stages of the suballuvial bench, when it extends with gentle ascent beyond the reach of its alluvial cover and becomes "a subaërial bench, across which the detritus from the vanishing [subaërial] front is swept at times of cloudburst. . . . This emergence of the bench and its persistence as a subaërial feature appears to be most characteristic of granite ranges. . . . The phenomena are exemplified in the group of mountains in southern California west of the Colorado river near the Needles. . . . Here broad alluvial enbankments, from six to ten miles across, rise by a gentle slope to the summits of the ranges, where there are residual rock crests, or 'nubbins," and stretches where the crest has entirely vanished as a protuberance above the general slope. Within a mile or more of the summit one passes, without appreciable change of slope, from the alluvial detritus of the embankment on to a bare rock surface [subaërial bench] extending to the nubbins of the crest. The upper limit of the alluvium is a feather-edge."

A few statements appear to be too general. It is hardly true that "the encroachment of alluvial embankments upon the mountain slopes from which they are derived is a general phenomenon peculiar to the desert." Deglaciated troughs are characterized by locally supplied talus and by fans from their hanging lateral valleys which bank up against and encroach upon their oversteepened sides. The emerged sea cliffs of an uplifted mountainous coast are encroached upon by talus, which accumulates because waves no longer sweep the cliff base clean. Fault scarps may also give rise to encroaching talus. It is hardly to be supposed that the writer of the above-quoted passage is ignorant of these examples, but if a reader of the passage took it literally he would be misled.

The extension of the analysis to regions where abundant fine detritus is freely transported by prevalent winds would be advantageous; for while it may be agreed that the wash of cloudburst rains rather than transportation by winds is dominant in controlling the graded forms of our southwestern deserts as they now exist, it may be fairly deduced that wind action gains in importance in the later stages of the desert cycle, even to the point where it would cause general degradation; and at a stage when this holds true, it would be incorrect to say that " for every enclosed basin there is the aggradational flat of the playa." Some playas may in a later stage of the arid cycle be degradational; that is, in spite of receiving fine detritus brought by centripetal wash, the occasional complete removal of the playa detritus by the winds may expose the underlying rock surface to slow degradation—just as the occasional lift of detritus from graded stream channels by floods and from abraded platforms by storm waves permits the slow degradation of their rocks.

It would be a boon to geographers if the author of this able and original analysis would apply its results in a technical and detailed description of several actual desert ranges, as a test of its practical value. Such a description, although terse, would be full of intelligible meaning to those who had studied the analysis on which its technical terms would be based; it would of course be unintelligible to readers unacquainted with the terms. The descriptions would thus serve as examples of advanced physiographic work, and would correspond to advanced work in various other sciences. Geographers who decry the use of advanced technical terms, such as Lawson's analysis involves, would leave geography in a position unlike that which has been reached by the more progressive sciences, greatly to their advantage, and hold it down to the mental level of the school boy or the uninstructed traveller.

W. M. Davis.

J. T. Jutson. *The Deserts of Western Australia.* An outline of the physiographical geology (physiography) of Western Australia. W. Austr. Geol. Surv. Bull. 61, Perth, 1914, 240 p., 119 figures, including many half tones, 3 maps, references, glossary and index.

Western Australia, comprising a third of the antipodal Commonwealth and consisting largely of granites, vertically foliated schists, and inclined bedded rocks, is characterized by a surface of gently undulating form, though far from being dead level, over vast areas. Near the coast, the undulating surface is described as an uplifted peneplain, not yet dissected enough to destroy the accordant heights of the inter-stream residuals; in the dry interior, the rising inland extension of the peneplain is largely reduced to an even upland of less altitude, that is believed to be the product of arid erosion, or "levelling without baselevelling." Here the remnants of the earlier peneplain often possess a smooth surface, even though composed of granite, and descend by abrupt and ragged escarpments, known as "breakaways," to the somewhat lower but equally smooth surface of the later formed upland, a streamless desert region at altitudes between 1,200 and 1,800 feet, largely covered with sandy detritus of local origin, and here and there occupied by very shallow depressions floored with saline clays. It is pointed out, however, that the same processes to which the lowered and still lowering arid upland beneath the remnants of the earlier peneplain is due, are at the same time lowering the remnants themselves without destroying the evenness of their surface. Much work is attributed to the winds, and in this respect the explanatory treatment of the Australian desert here given differs markedly from that of the American desert in Lawson's article, reviewed above. Among other topics discussed by Jutson are the "deep leads," or channels containing auriferous gravels, the development of river courses, fault scarps and fault-line scarps.

This physiographic outline is of interest as an example of analytical presentation which is intentionally and essentially geological, in that it is concerned more with the origin than with the description of existing features, and which is nevertheless of geographical value, as far as the inorganic landscape is concerned, in that it offers much more information regarding the existing features of its region than is ordinarily to be found in the writings of geographers themselves. It is, moreover, physiographically so well modernized that it treats rock structure as a fundamental element in the explanatory description of surface forms; it distinguishes between the processes of normal and of arid erosion, not merely in their present and momentary behavior, but in relation to the sequence of forms that they produce through the whole cycle of their action; and it uses various technical explanatory phrases, such as fault-line scarp and adjustment of streams to structure. Nevertheless, the analytical character of the presentation, conscientiously carried out by the author in the deliberate discussion of various alternative hypotheses, here as always interferes with the vivid realization of existing features by the reader, because of the prolonged attention demanded to possible conditions of the past. Geologically speaking, an analysis of the sequences of the past changes that a region has suffered is a responsibility that cannot be avoided—as long as geology is regarded as an historical science. Geographically speaking, analytical presentation is only a temporary device, necessary so long as the origin of the forms under consideration is uncertain, but unnecessary as soon as the results of the analysis are assured and systematized; for then the analysis that has led to valid conclusions should be replaced by the conclusions to which it has led. It would therefore be of service to geographers if the author of this valuable paper would prepare a regional geographical description of the region that he knows so well, in which his results might be concisely stated, without giving his reasons for them; but with the provisos that, if the results seem uncertain even to the author, their uncertainty should be frankly stated; and that, if the reasons for the results are novel and generally unknown, they should be presented in an appendix, where they will not interrupt the continuity of the description. Regional geography will not reach full development until it is thus freed from the distraction of antecedent analysis.

W. M. Davis.

Comstock, Anna Botsford. *Trees at Leisure.* Pp. 56. Ithaca, Comstock Publishing Co., 1916. 50 cents.

A little essay appreciative of the attractiveness of trees as they appear in winter. The text shares equally with beautifully artistic reproductions of the trees common to northeastern United States.

A "Selected List of Books on Mountaineering" has been compiled by LeRoy Jeffers, F.R.G.S., librarian of the American Alpine Club and secretary of the Bureau of Associated Mountaineering Clubs of North America, of which this Society is a member. The New York Public Library publishes the pamphlet, of which a revised edition has recently been issued. The volumes are all to be seen at the New York Public Library.

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PLATE I. HOOSICK VALLEY AT WILLIAMSTOWN, MASS. One of the dairy districts of western Massachusetts.

SOME RESPONSES TO ENVIRONMENT IN MASSACHUSETTS.

MALCOLM KEIR,

ASSISTANT PROFESSOR OF INDUSTRY, UNIVERSITY OF PENNSYLVANIA.

The picture of Massachusetts to hold in mind is a rectangular state, mountainous in the west, hilly in the center and with lowlands in the east. Nestling between the western mountains—known as the Berkshires—lies the small narrow Berkshire valley, while shouldering aside the central hills is the broad valley of the Connecticut River, separating the hill region into a western and an eastern highland. The latter gives place to the eastern plateau, and this in its turn grades into the coastal plain, a depressed section of which at the head of Massachusetts Bay is called the Boston Basin. The Berkshires may be identified by the city of Pittsfield; the Connecticut Valley by Springfield, which stands as its doorway; the eastern highland by Worcester, the metropolis of all the central region; and the Plain and Basin by Boston, the center for the activities of all parts of the state adjacent to the sea.

Standing out from this physical background are two factors—one the prevailing direction of the hills and valleys, the other the visitation of the glacier—that have been of importance in controlling the destinies of the commonwealth. Our attention will first be directed to the fact that the hills and valleys which are such characteristic features of Massachusetts topography are not an unordered jumble of chaotic land forms but upon close scrutiny reveal that the common trend is from the north toward the south. This characteristic is most pronounced in western Massachusetts and least discernible in the east; accordingly there is no hard and fast line that separates the region where the north-south tendency of the hills and valleys is well marked, from that in which it can hardly be traced. Nevertheless, a line drawn from the point where the Merrimac enters Massachusetts, to the point where the Blackstone leaves the state, would, with a fair degree of accuracy, divide the commonwealth into two parts, of which the western, comprising about two thirds the total land area, would be the portion that clearly portrays the peculiarity under discussion.

The effect of the direction of the hills and valleys is to shut off the portion of the state west of the Merrimac-Blackstone line from free communication with the coast region. The Connecticut Valley is an exception for it may be reached easily from the coastal plain by means of the Connecticut River. The conformity to rule, displayed by the topography and the consequent segregation of the eastern district is so easily stated and so readily recognizable that its significance may be overlooked and the consequences that arise from it either ignored or attributed to other causes; nevertheless, the parts of the state earliest settled, the present distribution of population, the routes of roads, canals and railways all have been swayed by this feature of the environment. Furthermore, manufacturing and agriculture have been moulded by the direction of their outlets, and even the variations in the type of summer visitors found in different parts of the state have been induced by the prevailing tendency for hills and valleys to cross the state from north to south.

Having passed over the ocean, the Pilgrims and Puritans found themselves in that portion of Massachusetts which is most free from hills. The pioneers encountered no natural difficulties when they established communities north or south of Plymouth and Boston, for the land parallel to the coast, although by no means perfectly flat, interposed no great obstructions across the path of travel, but on the contrary, offered gentle rises and broad shallow valleys easy to overcome. Even toward the west the country was open and comparatively level for a short distance, the present town of Framingham marking the edge of the favored district; but beyond this point the higher portions of the plateau were encountered, hills became more numerous and harder to climb until insensibly the highland region was reached. Within the highlands few streams cut pathways through the hill barriers and fewer valleys offered easy passage, therefore the "grain" of the country, so to speak, blocked travel toward the west, and held settlers on the coastal plain and lower plateau. As a consequence the early towns were strung along the shore or as far back from it as the coastal plain extended, but stopped short when the highlands were confronted.

When the harmony of the first towns was disrupted by dissensions and the disgruntled or adventurous members of the little companies went forth to establish new homes it was ease of travel along the coastal plain that led them southward to Providence (R. I.) and

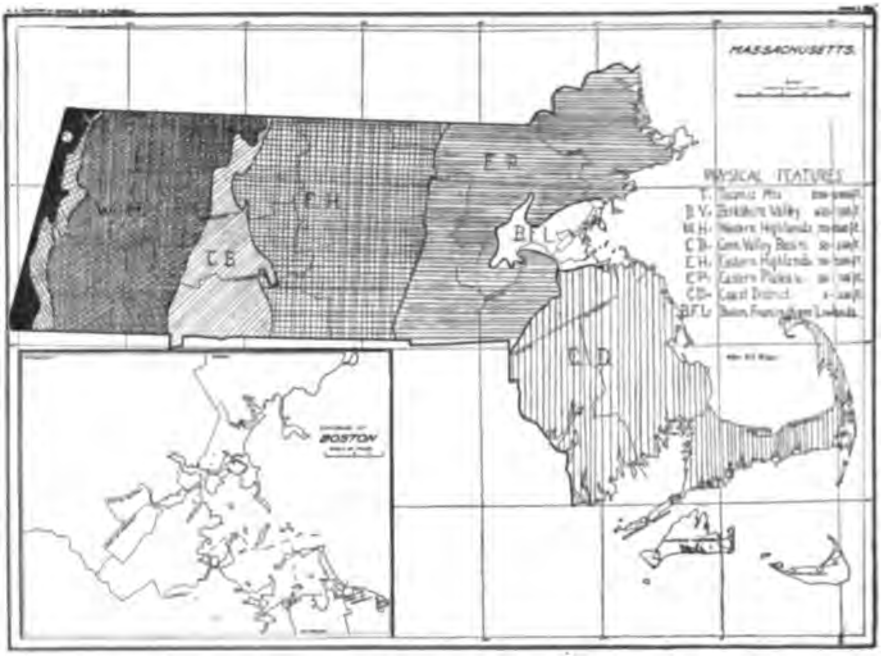

FIG. 1. THE PHYSICAL DIVISIONS OF MASSACHUSETTS.

Saybrook (Conn.). The Connecticut River, whose mouth was at Saybrook, lured settlers from that tiny outpost onward to the upper river valley, because the waterway afforded so advantageous a means of transportation and was the only easy route by which the interior could be reached. In 1631 William Pynchon, hailing from Cambridge, founded Springfield, the first settlement in the portion of the Connecticut Valley that lies within Massachusetts. All the expanse of the eastern highland and plateau, a land of infinite hills, separated the new village from the towns along the Atlantic, with the result that for a hundred and fifty years after its foundation there was no overland connection between Springfield and eastern Massachusetts, and the little fortification constituted the remote western frontier, a refuge for pioneers fleeing from war-crazed Indians and itself the scene of redskin outrages. So little influence was exerted by the home government of Massachusetts at Boston over the distant colony, that the people sheltered by Pynchon's stockade affiliated themselves politically with Hooker's town of Hartford (Conn.) further down the Connecticut, and they very reluctantly withdrew this natural association to recognize the artificial political authority of the general court of Massachusetts, seated so far away at the head of Massachusetts Bay.

If the physical conditions had permitted, it is entirely probable that the first colonists would have penetrated the interior of the state, and set up solitary detached homesteads just as immigrants did in later years when the western prairies were opened. If such had been the actual event then the town economy so closely connected with the name Puritan could not have developed as strongly, and the state and nation would have been the losers thereby; furthermore, agriculture would have replaced commerce as the leading industry, since it would have been the only one possible, and the whole course of American history would have been altered. As it was, the innate predilection of Puritans toward town government was given full encouragement by the natural environment and the gregarious instinct was not only not thwarted by nature but actually abetted, for the people were held close together either along the coast or in the Connecticut Valley whereas the rest of the state remained detached, isolated and unpeopled.

Fear of the Indians might have brought about the same result when the colonies were first established, but this factor disappeared in a comparatively short time, so that a spreading out of population would have taken place if the natural checks had not kept it constrained. The power of the church in government matters also tended to create population centers, for a town could be incorporated as soon as a place of worship was built and a minister provided, and inasmuch as the compelling motive for emigration had been religion, the people desired churches as soon as their homes were erected. The church was such an important feature in a Puritan's life that it acted as a magnet in holding individuals within sound of the Sabbath bell. Notwithstanding this fact the church would have lost much of its power to bind men together if the topography had favored their drifting apart. The necessity for defense against a savage enemy, and the power of religion worked together with the influence of land forms to produce a dense population on the Massachusetts coast, yet if the steadfast force of hills and valleys had been taken away the tendency for settlers to lose themselves in the all surrounding land could not have been prevented. Therefore we must attribute the early grouping of the population of Massachusetts to the rigors of the journey westward across the hills as contrasted with facility for movement in the littoral and river zones.

The massing of the poulation in the lowland and valley had a direct bearing upon the industries conducted within the commonwealth for it did not take long for the people, especially those near the coast, to discover that greater wealth could be drawn from a generous ocean than from a niggardly land, and that the harvests which furnished the largest profits were not the yields of fields garnered into barns, but fish, sugar, and molasses gathered into warehouses from the holds of sailing vessels. Commerce became the leading industry with fishing and shipbuilding as corollaries, a condition which was unchanged for two hundred years. Inasmuch as commerce is an urban business, the tendency away from rural life fostered by the topography was furthered by traffic, and coast towns increased in size. Hence the characteristic grouping of the population was maintained.

During the first half century after 1800 political and economic changes made commerce unprofitable, but the condition of settlement stimulated by this industry was of great benefit to manufacturing, and aided it to take first place in the affairs of the state. For instance, the Portuguese population of New Bedford, attracted to the city by the trade of whaling, went to work in the cotton mills as operatives, when the factories were erected; and the fishers' wives living in Marblehead and Salem, who had long bound shoes for Lynn " factors," followed the job into the shoe shops after machinery was adopted. In the Connecticut Valley when Springfield ceased being the point for the transshipment of water-borne cargoes, its strategic location made it a railroad center, so the people at the crossing point of the two principal travel routes—one north and south by the river, the other the land trail east and west—were not dispersed but augmented when locomotives replaced boats. The population assembled by the river and rail traffic proved an excellent nursery for the development of manufactures and made Springfield the home of factories of widely divergent types.

The great impediment to progress in manufacturing in the early history of the United States was the dearth of labor, but in Massachusetts the natural environment had long pressed the people into narrow confines, so that when manufacturing was an infant industry it could draw upon the army of labor already mustered in a few camps. Most auspiciously the first industry, commerce, wherein this body of labor had been enrolled as an escape from the natural restrictions of its environment, was on the decline just at the time when factory enterprisers were seeking employees. Hence the well-defined segregation of the inhabitants of Massachusetts has been of immediate benefit to the two industries which have commanded the most attention in the state, and has been a potent though silent factor in bringing those industries into the foremost rank. The result is that the isolation of population in the east and along the Connecticut River first made necessary by topography has not only been preserved to our day, but actually made much more conspicu-

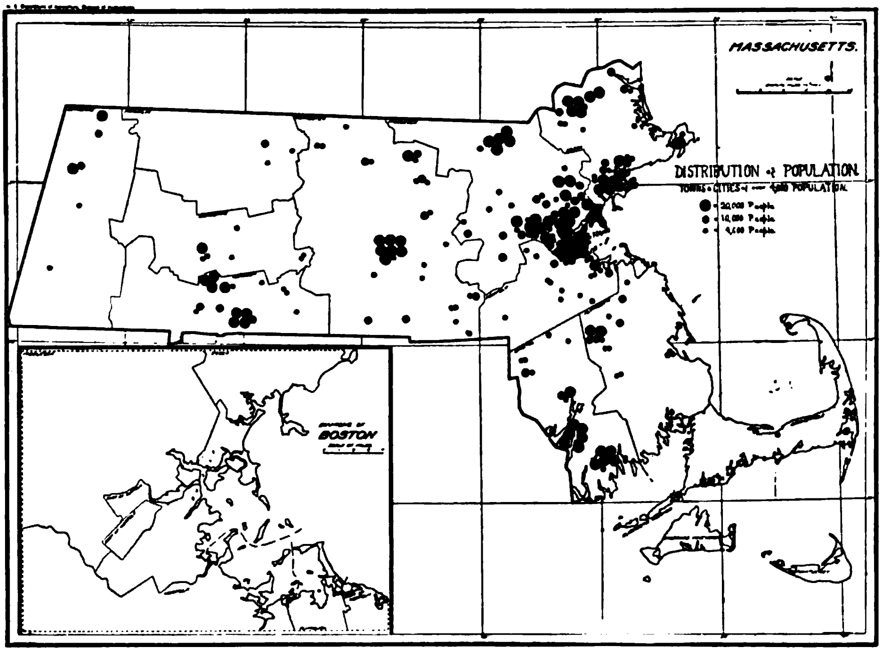

FIG. 2. DISTRIBUTION OF CITIES IN MASSACHUSETTS.

ous, for the industries have emphasized a condition which they did not create.

The present distribution of population follows closely the lines laid down by the original settlement, as may be shown by a study of the cities. The section of Massachusetts least under the influence of hills is the Boston basin, whose boundaries may be roughly designated by a circle fifteen miles in radius and drawn about Boston as a center. Within this area, movement is almost unhampered, hence from the earliest times down to our day, people have swarmed across this plain. Fifteen out of the thirty-three cities of the state, housing thirty-eight per cent. of the total population, are located within the basin; in other words, nearly two fifths of the men, women and children who live in Massachusetts are within sight of the gilded dome of the State House. As a result, Boston is the only one of the twenty-five largest places in the United States that has more people within ten miles of the city than within the metropolis itself.

The communities which surround Boston are not suburbs in the sense of being merely overflow dormitories for men whose business is in the capital,—as is so frequently the case elsewhere,—but on the contrary, each town has a distinct individuality of its own and a lineage almost as ancient as Boston itself. For example, Cambridge, founded in 1631, has a population exceeding that of Albany, Des Moines or Spokane, and its university sheds luster on its great neighbor across the Charles River. Lynn, incorporated in 1629, is larger than Troy and is the greatest shoe city in the world. Somerville[1] is greater than Savannah, Duluth, Norfolk, Utica or San Antonio. It is the abbatoir of Massachusetts, outranking all other places in the state in slaughtering and meat packing. Chelsea,[2] whose history dates from 1638, is prominent in the manufacture of rubber goods and shoes, while in Peabody, Salem (1629) and Woburn (1642) tanning and finishing leather predominate; so the list might be continued, each city distinguished in some one of the industries of the state and maintaining a high degree of personal difference despite their close proximity to each other and to Boston.

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[1] Incorporated in 1842, therefore an exception so far as lineage is concerned.

[2] Population exceeds that of Jacksonville, Wichita, Galveston, Kalamazoo or Racine.

Next to Boston basin, the portion of Massachusetts that is least divided into narrow strips by hills is the lowland that parallels the ocean and extends back from it for about twenty miles. Outside of the basin, which of course is part of the lowland, there are nine cities in the coastal zone and into these places sixteen per cent. of the population is crowded. The physical features which kept Puritans near the shore are still operating to hold the people in check, for upon the lowland one may find more than half (54 per cent.) of all the persons who dwell in the state.

In all of highland Massachusetts there are but eight cities, notwithstanding that in territory this section comprises two thirds of the area of the state. The location of these communities points to the influence of the trend of the land, for seven[8] are either at the heads of valleys and therefore the extreme limit for ingress to the interior from the south or at strategic situations where the few east-west valleys cross the north-south ones. In general the highland cities (containing 12 per cent. entire population) are smaller than those in the lowland, because they are more difficult of access. If the percentages of population represented by the thirty-three cities are totaled one comes upon the astonishing fact that two thirds of the human beings in Massachusetts live in an environment of paved streets and policemen. Since most of the inhabitants of the state nestle under the shadow of Boston and the remainder in cities widely separated from each other, it follows that much of Massachusetts is curiously empty, despite the fact that next to Rhode Island, Massachusetts has more people per square mile than any other state in the union. This anomalous condition has been brought about by the arrangement of the hills and valleys, for it first segregates the coastal district from the interior and then separates each group of inland cities from the others, exerting a quiet, powerful influence in determining which parts of the state shall be filled with people and what parts almost deserted.

What has been said in regard to the control topography has exercised over settlement from the time of landing of the Pilgrims down to our own day, may have foreshadowed what we have to tell concerning transportation; for both the distribution of the population and the routes of traffic have been under the same dominance.

[8] The exception is Holyoke, created by water power.

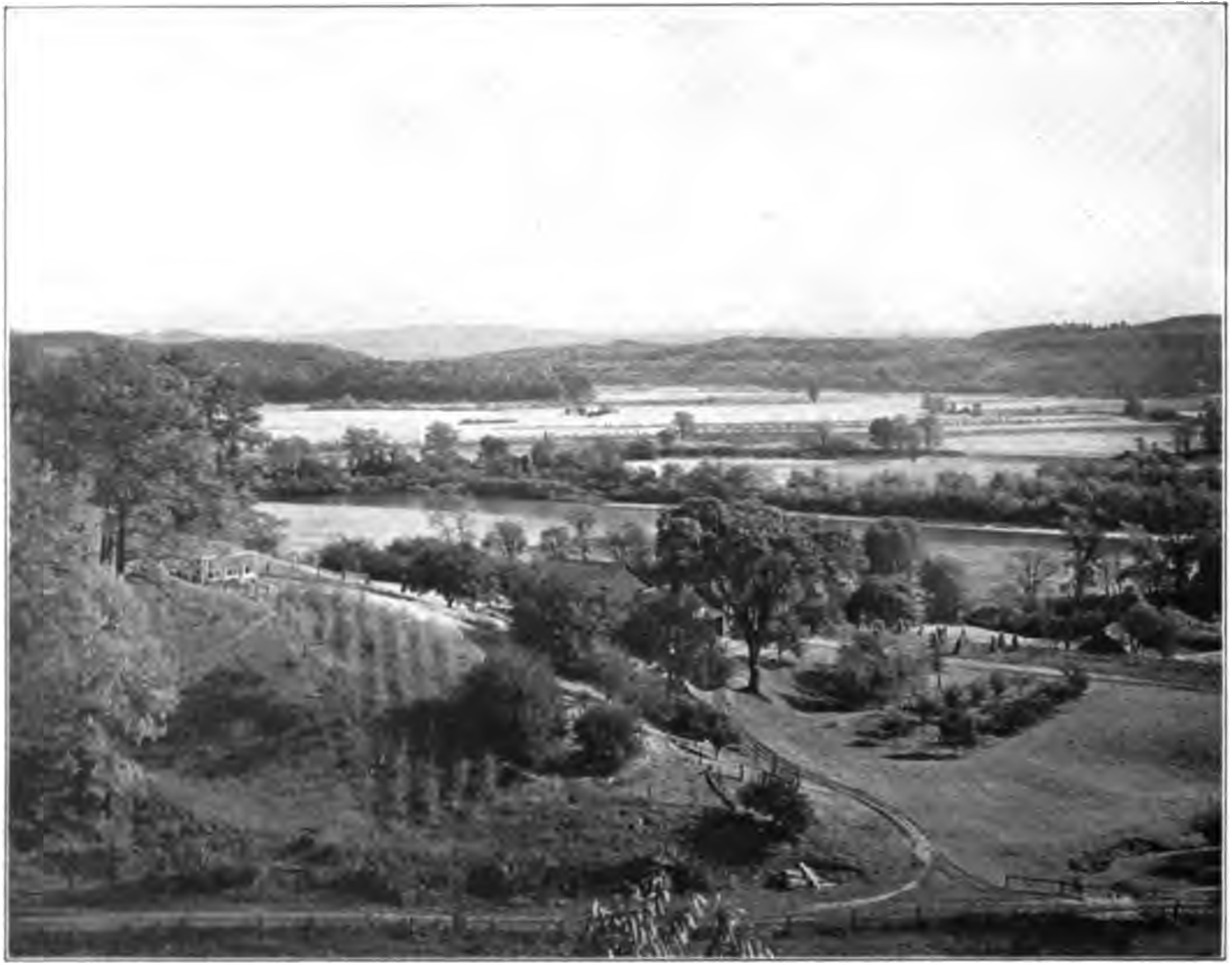

Plate II. Deerfield Valley at South Deerfield, Mass., Near its Junction with the Connecticut Valley.
(Courtesy of Boston & Maine Railroad.)

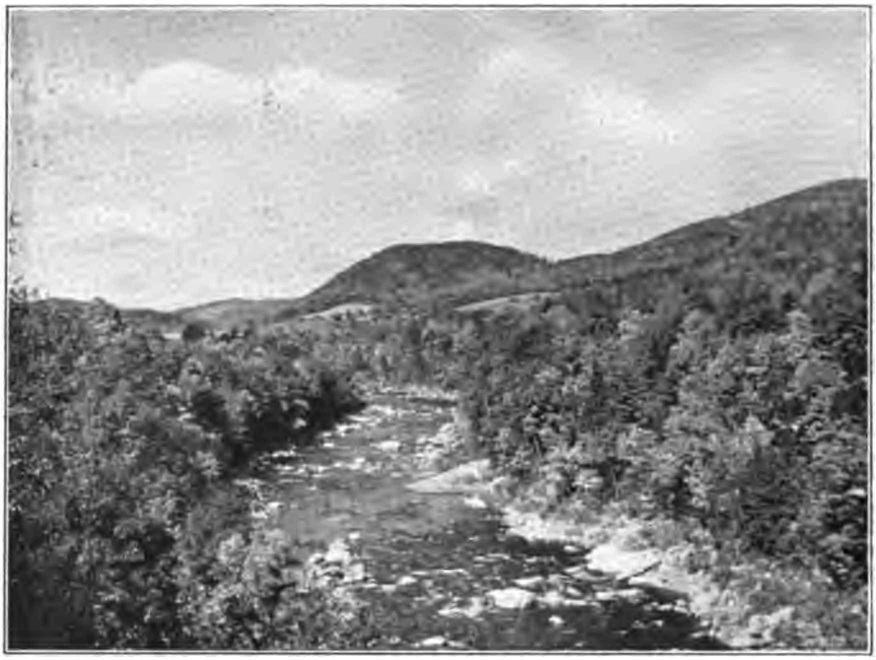

Plate III. Catamount Mountain and Deerfield River, Shelburne Falls, Mass. A typical scene in western Massachusetts that shows why roads follow river valleys.

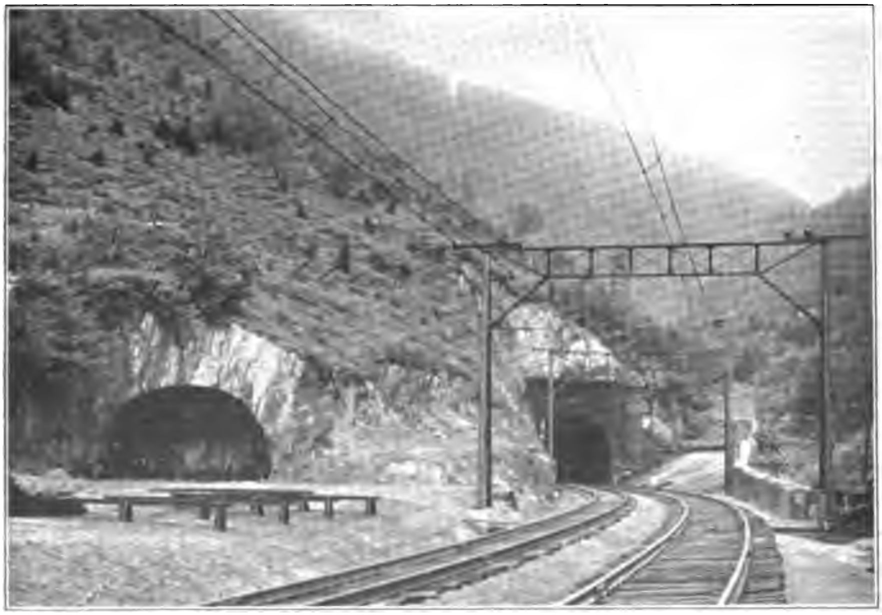

Plate IV. East Portal Hoosac Tunnel, Boston & Maine Railroad.

The unequal apportionment of the low and high land in Massachusetts has given rise to two distinct types of transportation routes, the one associated with the maritime province, the other connected with the western hills, valleys and mountains. The Merrimac-Blackstone line which we have already defined marks a zone that is the division area between the lowland type of route and the highland.

Since the ease of travel upon the lowland produced a dense settlement within this restricted domain we would expect the earliest and most complete development of all forms of transportation to take place there. At a time when most communication between colonies was by means of boats and within nine years (1639) after its own foundation (1630) Boston was connected with Plymouth by a road overland. Weymouth, Concord, Salem, and Lynn were not slow to follow in the opening of roads, so that soon Boston became the center from which many routes radiated, and with succeeding

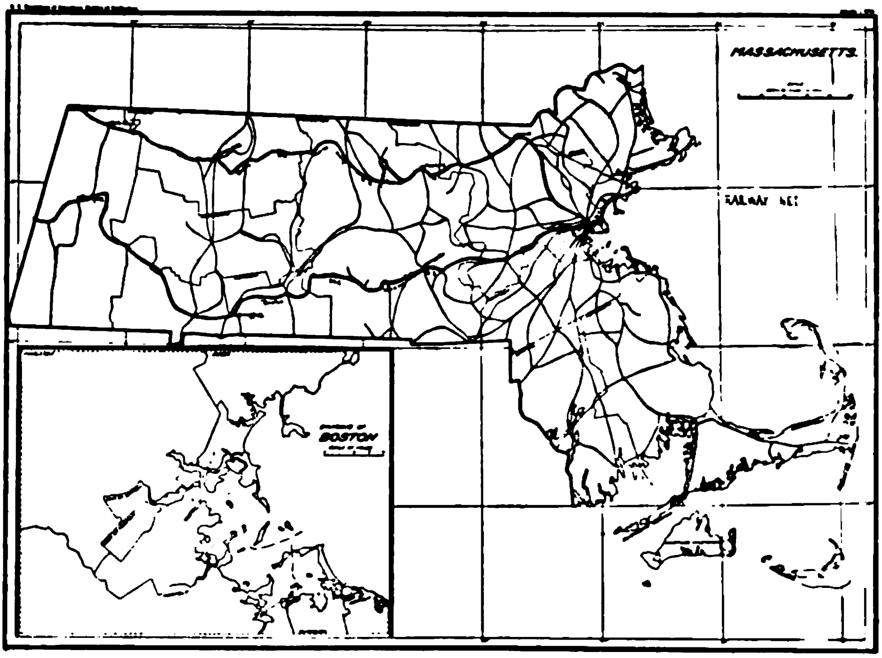

FIG. 3. THE RAILWAYS OF MASSACHUSETTS.

years the multiplication of villages, towns and cities but heightened the characteristic. Boston was selected by nature for this rôle because it is both at the middle of the lowland's sea border and at the head of Massachusetts Bay, while Salem, its early rival, is on the outer rim of each and Plymouth is entirely outside; the latter place suffered too in prestige because the soil back of its confines was too poor to be conducive to settlements. All roads, therefore, led to Boston and made it the metropolis for the entire coast district.

The northern position of Boston in respect to the other settlements along the Atlantic would naturally turn the main stream of outward travel in a southern direction, therefore it was but logical for the first stage coach line (1767) in Massachusetts to run between Boston and Providence. The usual method of incoming travellers was to proceed from southern points to Providence by boat and then continue their journey by land, using the stages that ran between the two northern cities, so as to avoid the tiresome and often dangerous voyage around Cape Cod. Gradually the stage routes were extended southward along the coast touching New Haven, New York and Philadelphia, so that eventually salt water travel could be avoided entirely if one so desired. It was almost twenty years after the first line along the coast was established that coaches overcame the trials of westward journeys from Boston toward the Connecticut River and thence southward, although this route later became famous on account of its shortness.

Roads and stage line appeared in the towns of the Massachusetts shore zone as early as any places in America, and likewise, about the beginning of the nineteenth century, when the canal fever burned so hotly in the United States, Massachusetts was one of the first states to charter this form of a waterway. Boston was joined to Lowell by the Middlesex Canal in 1808, in order to give an outlet for Lowell's rapidly growing cotton factories through the port of Boston. Compared with the Pennsylvania and Maryland canals the Middlesex was constructed with the greatest ease because the low plateau through which it was cut raised so few engineering problems, and also for the reason that the total length was twenty-seven miles, such a short distance between termini being a characteristic of routes confined to the Massachusetts coast area, since no two cities could be very far apart.

The Middlesex Canal, like most of the others built in the first flush of the craze for internal improvements, lost its prestige when a railroad paralleled its course (in 1835). The Boston and Lowell Railroad was one of three chartered and completed at about the same time, the Boston and Providence, and Boston and Worcester being the other two. Inasmuch as these roads ran north, west and south it is apparent that the tendency for all routes to *radiate* from Boston was not broken. The towns along the north shore were united to the metropolis by the Eastern Railroad laid down in 1838, thus adding one more spoke to the wheel that turns around Boston. Branch lines from these four principal outgoing routes reach every community in the coastal plain or plateau, and with the junctions formed between the main roads form a complex web of steel that binds all of the coast region to the capital city.

The work begun by steam railroads has been continued by street railways, starting in Boston in 1856. Horse car lines running from Boston to Charlestown, South Boston and Lynn began a process of consolidation which electric cars have completed, for all of the fifteen-mile circle of communities in the Boston basin are to all intents and purposes one single metropolitan area. Not only the towns and cities immediately adjacent to Boston are corded with electric transportation but even places so distant as Gloucester, Providence and Worcester.

The automobile truck is the latest conveyance transferring both passengers and goods from town to town; the service inaugurated by the railroads and extended by the electric lines is made intimate and complete by the trucks. The railroads touched one part of a town, trolleys came into the main streets, but trucks may go from house to house. Trucks are the latest most personal transportation factor in Massachusetts. With these three, locomotive, electric car and truck, no place in eastern Massachusetts can remain remote or isolated, whereas before their coming even Cambridge was a great distance from Boston.

Nowhere else in Massachusetts or in all New England can there be found a condition that duplicates the picture we have just sketched, because in no other portion of the state or in the group of states to which this one belongs is there such a lack of hills, mountains and valleys that men may build roads, canals and railways where they will. The presence of hills to the west made people content to stay on the easily traversed strip of land near the Atlantic and gave rise to such a density of population that every mode of transportation was seized upon and speedily developed. The peculiarly favorable position of Boston, combining the advantage of a site most admirably adapted to communication by water, and a situation that gave it command over all land trails, forced it to become the focal point for all roads and conveyances.

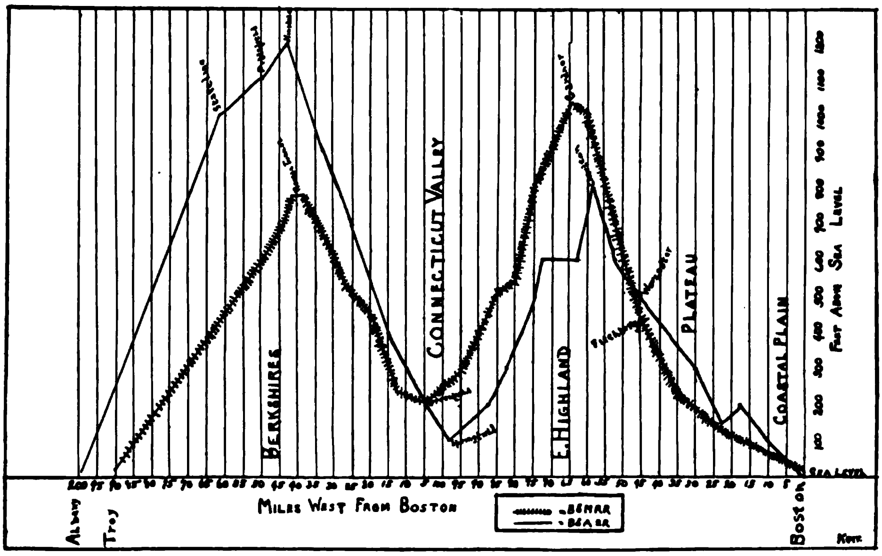

Fig. 4. Profiles of the B. & A. and B. & M. Railroads.

If one crosses the line drawn between the Merrimac, at the northern boundary of the state, and the Blackstone on the southern, one is soon aware that transportation in the western section bears no resemblance to that across the line in the east, for there is no center toward which all roads run, but there are as many highway systems as there are valleys. The further west one goes the more independent and less related each valley system becomes, for the intervening hills are converted into barriers more and more difficult to cross, so that the usual routes of travel, instead of converging upon a particular point, run parallel to each other. In order to understand the transportation of interior Massachusetts, therefore, one must know the disposition of the valleys.

The distribution of valleys in central Massachusetts gives rise to a picture which resembles a gigantic bug, of which the Connecticut forms the body, while the Deerfield and Millers River valleys constitute the forelegs and the Westfield and Chicopee valleys the hindlegs. The articulation of the right and left "limbs" is so symmetrical that these are of the greatest consequence in all transportation across the state, for roads like veins run along the "legs" and down both sides of the "body." These four east-west valleys are the only ones available for overland traffic, yet even these were neglected for a century and a half after settlements were made in the central and western parts of the state, because most of the pioneers who took up land came by way of the numerous valleys that opened from the south, the chief highway of course being the Connecticut River.

The first stage line to connect the east coast with the Connecticut Valley ran between Boston and Springfield and made use of the Chicopee route for the reason that, in all the welter of high land and low, this was the one course reasonably free from obstruction. Along this so-called "Boston Post Road" one traveled comfortably across the Boston basin to its edge at Framingham where one commenced the wearying journey up hill and down dale until the tiny valley gouged from the hills by the Seven Mile River permitted the coach to follow the trough instead of struggling over the crests. The Seven Mile runs into the Chicopee and the latter joins the Connecticut, but despite the fact that the valleys offered smoother going than the previous road across the ridges they were little better than gorges, so it was not until the Connecticut was reached that a jolting, rocking, bumping coach could settle into an even glide. Where there is little choice one must take what one can get, so these narrow, rough valleys had a high value, because there was no better route that wayfarers might select.

The Connecticut River and the Chicopee trail were the only valuable inland routes[4] in Massachusetts until the state began canal construction. The places where canals were built and the effect they had upon the industrial life of Massachusetts clearly point to the influence of the trend of hills and valleys. The first attempts at canal operations were at falls in the Connecticut River, beginning in 1795 at what is now Holyoke and continuing until 1892, when the last rapids were looped by water detours. These canals gave the valley towns uninterrupted boat traffic to Long Island Sound and strengthened the bonds of trade between the valley and New York. A canal following the valley of the Farmington River was opened from Northampton above Springfield to New Haven (Connecticut), in order to give the Connecticut city a share in the valley trade. Worcester dug itself out of the enfolding hills by canalizing the Blackstone River so that her products could be shipped by barge through the port of Providence. This event marks the beginning of the rise of Worcester, for until that time (1828) it had been a struggling village of three thousand people isolated by its interior location. Given an outlet for the first time by the canals, which was enhanced later by railroad communication, it has grown to be the second largest city in the state. It is noticeable that none of these canals ran east and west, but all followed the general trend of the valleys in the other direction, and it is from this fact that the canals gained their greatest importance, for they were the direct cause for the introduction of railroads.

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[4] The value of the river as a highway is clearly proven by the repetition of names of towns. Thus Hanover, N. H., commemorates Hanover, Conn. Haverhill and Newbury, Vermont, are direct descendants of Massachusetts

With the towns in the Connecticut Valley pouring their products into New Haven and New York, and with Worcester adding to the prestige of Providence, Boson felt that she was losing her title to supremacy and sought a remedy whereby she might be the gateway for the entire state. She first proposed to connect the Merrimac with the Connecticut and then cross the Berkshire Hills to the Hudson River, but this waterway, gigantic for its time, never got beyond mere talk, since canals were discarded in favor of railways. Boston turned attention to them as a salvation, for she hoped to divert the traffic of the Connecticut River towns and of Worcester to herself by a railroad across the state.

The Boston and Worcester Railroad, chartered in 1831 and

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towns of the same names. Other examples: In New Hampshire, Charlestown, Springfield and Concord. In Vermont, Springfield, Windsor and Newport.

opened four years later, was the product of Boston's scheme to overturn nature by artificial means. To make the whole width of the state contribute to Boston, the Western Railroad in 1839 continued the B. & W. to Springfield[8] and then within two years more tapped the Hudson at Albany. Notwithstanding the fact that these railroads faced westward, contrary to the rule that traffic moves north and south in highland Massachusetts, nevertheless the engineers who surveyed the right of way could find no better path across the state than the rough one via the Chicopee, first utilized by stage coaches. Beyond Springfield the Westfield River gorge was the only practicable path, therefore the scarcity of east-west valleys has forced all traffic to flow through the few that do exist.

Not satisfied with one line that crosses only the southern part of the state, a second road, the Boston and Maine (1836), was pushed across northern Massachusetts, and the difficulties it met well illustrate the influence of land forms on travel.

This railroad ran out of Boston by a circuitous route to Fitchburg; beyond that city it was forced to travel around a long loop in order to climb to the top of the eastern highland which it crossed to Gardner. From Gardner it searched out the narrow valley of Millers River and followed it to the Connecticut Valley. At that point the westward reaching valley of Deerfield invited further travel, but at the headwaters of the Deerfield there towered the ridges of the Hoosac Mountain Range. Across the mountains at North Adams, there was a river valley (the Hoosic) pointing in the right direction for the railroad but the range was in between. For twenty years the railroad was halted while a tunnel was being pushed through the five miles of mountain mass, and to open the passage cost sixteen million dollars. From Fitchburg (Mass.) to Troy (N. Y.), the Boston & Maine has been under the heavy handicap of overcoming natural obstacles, because it runs contrary to the lines laid down by topography.

Long before this second east-west line was established, junctions were made by the towns upon the Boston & Albany with the railroads that crossed Connecticut and Rhode Island. Thus Springfield was connected with Hartford in 1844 and later to New Haven and New York, the road eventually becoming part of the New Haven

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[8] The roads were later consolidated under the name Boston & Albany.

Railroad system. As an outlet for Springfield it followed the natural line of the river valley, the route to which the city had long been accustomed, so it has proved of greater importance to the valley metropolis than the connection eastward to Boston. The accompanying list of river valleys and railroads proves that the tendency to use the natural travel routes was not confined to one valley and one railroad but was general.

	Railroads.	
River Valleys.	Northern Terminus.	Southern Terminus.
Farmington and Quinipiac.	Northampton (Mass.).	New Haven (Conn.).
Willimantic and Shetucket.		New London (Conn.).
Quinnebaug................	Southbridge (Mass.).	Norwich (Conn.).
Blackstone	Worcester (Mass.).	Providence (R. I.).
Housatonic	Pittsfield (Mass.).	Norwalk (Conn.).

Everyone of these railroads extended in the general north-south direction and coincided with the long used systems of highways that bound central and western Massachusetts to the states on the south rather than to Lowland Massachusetts to the east.

Since 1850 the state has been covered with the lines shown on the map, so that no part is far removed from a railroad, yet a close inspection will reveal that the apparent confusion of routes actually clings to the rules laid down by the first roads, for even today there are but two trunk lines westward, and all the branches from them run north or south. It is only around Boston in the comparatively low lying and almost level land that the word "web" applies, while to the rest of the state "stripes" would be a more fitting term, the "stripes" being vertical between two horizontal bands.

A study of the electric roads would disclose a case closely analogous to that of the steam lines, for the initial roads ran along the valleys, and are making east-west connection only now. The few that do cross the state east and west parallel the railroads and follow the well-worn paths in the Westfield and Chicopee River valleys.

The automobile routes, furthermore, that are listed in the Blue Books and outlined on the maps show forth the oft-repeated characteristics. We may make the generalization, therefore, that all travel in highland Massachusetts tends to run north and south by parallel lines following the trend of the hills and valleys, in direct

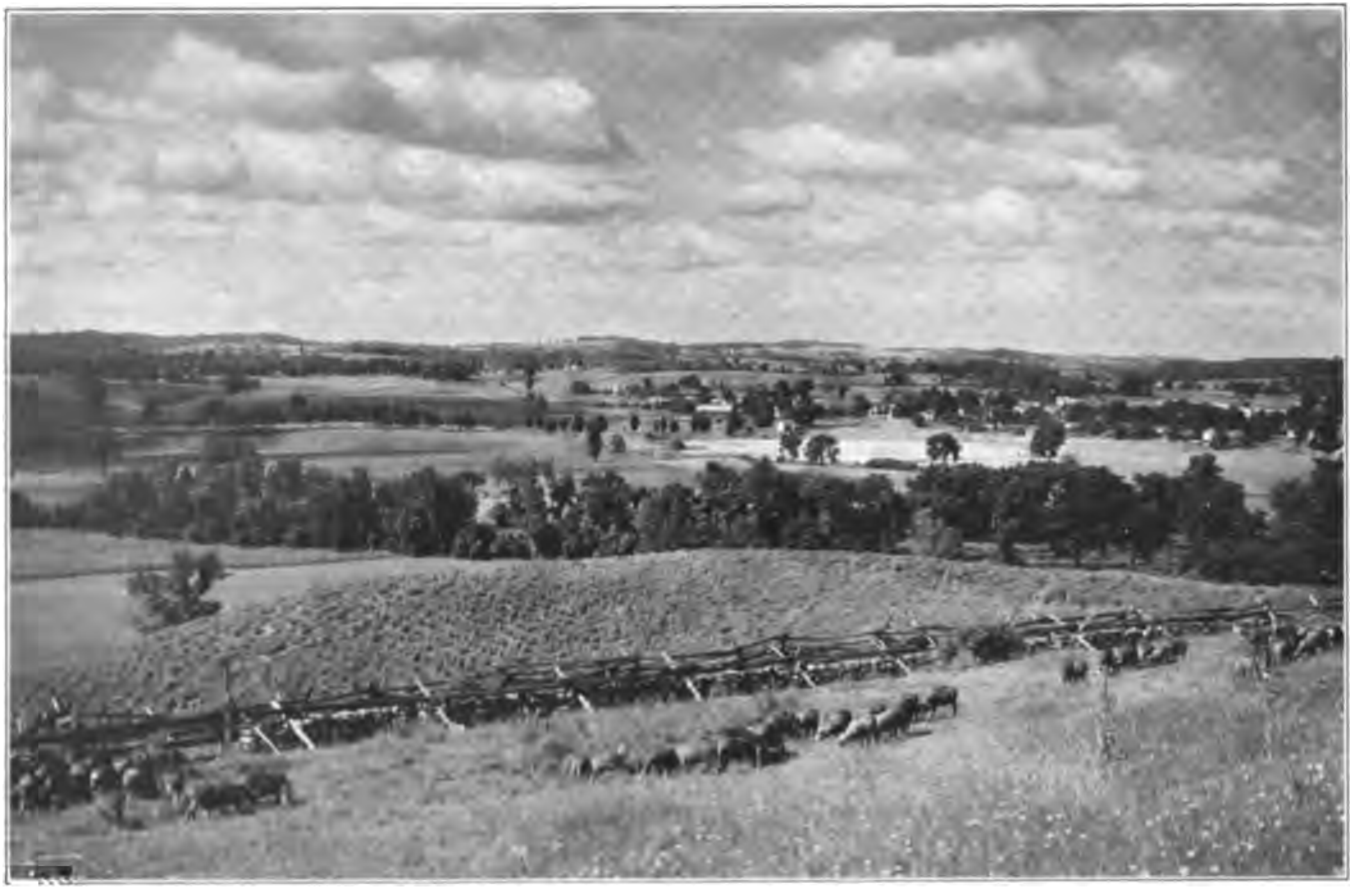

PLATE V. THE HOOSICK VALLEY.

contradiction to the system in the coast area, where travel all converges upon one point because there physical conditions not only permit but also encourage it.

The situation for the Highlands, that we have outlined, has a profound influence on the business relations of the commonwealth, for the commercial ties that are strongest connect western and central Massachusetts with New York, Connecticut and Rhode Island, rather than with Boston.

The direction of the Connecticut Valley which, as we have said before, formed the natural outlet for Springfield was southward; therefore, Hartford, New Haven and New York were more closely bound to Springfield by tradition, transportation and trade than that city's own eastern sister towns. The Berkshire Valley, reached from the south by the Housatonic River, whose mouth is on Long Island Sound near Bridgeport, Conn., has had a history similar to the Connecticut Valley and even a large part of its land is owned by citizens of New York City. The result is that western Massachusetts today feels independent of its eastern capital because its business relations, its summer visitors, and its main arteries of travel are all from the south, following the trend of the land. Boston is the hub of the coastal region of all New England but its outer rim falls far short of reaching its own western co-cities.

Furthermore a similar story could be told of most towns between Springfield and Worcester. There is nothing to hinder the spreading of the influence of Boston throughout the coastal plain and the eastern plateau, but the highlands to the west offer a bar in that direction, so it may be said that business relations with Boston and the attitude of regarding that city as a Mecca ceases at Worcester (the corresponding point in Connecticut is Stonington), beyond which point the Boston influence is highly diluted. Boston feared that canals would lessen her importance so she endorsed all railroad promotions for the purpose of strengthening her dominance; that her hopes have been most largely realized in the coastal region is due to no fault of hers, but to the trend of the high land across the pathways that lead to Boston. We are accustomed to hear Boston spoken of as the "Hub of New England" but as a matter of fact that is not strictly true, for she is the hub of the coastal area, only. Inland towns of Vermont and New Hampshire, just as the interior section of Massachusetts, turn toward the south for commercial affiliations, because southern cities are more easily reached than Boston on the east. If one realizes that two thirds of Massachusetts lies in the highland and mountain sections one can conceive how significant it is that these areas are shut off from eastern Massachusetts.

Not only have transportation routes and the distribution of population been vitally affected by the characteristic direction of the land forms but the industries of the state also have felt the moulding influence of their surroundings; particularly is this true in respect to manufactures, agriculture and the " summer vacation business."

(To be continued.)

THE PASSING OF THE GREAT RACE.[1] A REVIEW.

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In this remarkable book the author attempts "to elucidate the meaning of history in terms of race"; that is, to replace the older political and linguistic groupings "by the physical and psychical characters of Europe." The distinction between race, language and nationality is fundamental and confusion in these ideas in the past has seriously impeded investigation. The biological as opposed to the philological study of race problems is very recent. We now know that " race " has played a far greater rôle than either language or nationality in the evolution of mankind. The belief that language and nationality were important factors in the classification of man was accompanied by the wrong idea that changes in environment changed the nature of man. But biology shows that the differences in nationality and language are merely secondary; that the real difference is in race, and it is demonstrated that all future progress depends very largely on the recognition of the biological point of view.

Historians and philologians, by approaching the subject of race from the linguistic standpoint, wrongly evolved mythical races of men, such as the Latin, the Aryan, the Caucasian, the Indo-European and, most inconsistent of all, the Celtic. All such terms must now be given up. There was doubtless once an Aryan race, but it has long since vanished from the earth. Only a few years ago students were taught that the races of Europe were descended from that prehistoric race. As various peoples spoke related Aryan languages, it was but natural to suppose that not only were the languages descended from a common source but the peoples who spoke them. The term can now be used only of linguistic groupings. We must once for all discard the name "Celtic" for any existing race and henceforth use the term only in reference to a certain culture and type of languages. Thus the big, blond, red-haired Irishman of to-day is not Celtic, but chiefly Danish, with the addition of English, Norman and Scotch elements and, therefore, is as Nordic as the Englishman. On the other hand, the small brunette Irishman is Mediterranean in origin. Consequently Mr. Grant concludes that the Irish are not entitled to independent national existence on any racial ground; if there is any ground for the political separation of Ireland from England, it must rest, like that of Belgium, on religion and not on race. The utter inapplicability of the word "Celtic" as a racial term is seen by the fact that the Celtic speaking Welshmen are Mediterraneans, the Bretons are Alpine and the Scotch highlanders are Nordic; these three peoples have nothing in common physically, mentally or culturally. Modern anthropology shows that race, language and nationality are seldom found in combination and that racial lines are absolutely independent of any linguistic or national groupings. The only true principle of the science of race, is, as the author says, "the immutability of somatological or bodily characters and psychical predispositions and impulses"; for natural laws operate in human affairs with the same relentless force as in the phenomena of nature. The writer pessimistically concludes that the basis of government not only is, but always will be, force and not sentiment. Anthropology applied to history demands new methods and new definitions and shows that race alone is the real basis of modern society.

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[1] "The Passing of the Great Race or the Racial Basis of European History," by Madison Grant, chairman, New York Zoölogical Society, xxi (including Preface by Henry Fairfield Osborn) + 245 pp.; 3 charts; 4 maps; Index; Bibliography. Charles Scribner's Sons, New York, 1916. 9½ × 6, $2.00.

The central theme of the book is the distribution, qualities, achievements and present status of the Nordic race from its origin east of the Dnieper in Russia in late geologic times down to the present. It was gradually evolved in the forests and on the plains of eastern Germany, Poland and Russia, whence it early spread to Scandinavia, where still it is found in the purest form. This mighty race is everywhere characterized by special features, "blondness, wavy hair, blue eyes, fair skin, high, narrow and straight nose . . . great stature and long skull." All the blondness in the world, wherever met with, must be traced back to it. Everywhere it is a race of "soldiers, sailors, adventurers, explorers, but above all, of rulers, organizers and aristocrats," in sharp contrast to the other two subspecies of Europeans. Thus the Alpines are "always and everywhere a race of peasants, an agricultural and never a maritime race." The Mediterraneans, though inferior to the other two in bodily stamina, are "probably the superior of both, certainly of the Alpines, in intellectual achievement." In the field of art their superiority to the other two races is undisputed. The Alpines, starting from the Western Himalayas, entered Europe by Asia Minor and the Danube valley and brought the "bronze culture" with them. In Asia they founded the first real civilizations of history, those of the Tigris and Euphrates valleys; but in classical and modern times they have played a small rôle in the history of culture. The Mediterraneans, who entered Europe also from Asia via North Africa, gave to the world the civilizations of Egypt, Minoan Crete, Phœnicea and Carthage, Etruria, the Mycenæan culture, and, when invigorated by Nordic elements, "the most splendid of all civilizations, that of ancient Hellas, and the most enduring of political organizations, the Roman state." In other words to them is due the foundation of European civilization. To the Nordics, the only one of the three races indigenous to Europe (though their ancestors may likewise have come from Asia), is due all the chivalry and knighthood of Europe, feudalism, class distinctions and racial pride. The qualities which have made them superior to the other races of Europe and Asia are found by the author to be reactions to a former environment and the result of contact with other races; but above all they have been due to a spiritual endowment whose origin remains obscure. With trivial exceptions all Europe, then, is divided between these three races, though they overlap and have become mixed in places.

One of the most notable features of the work is the four maps at the end which the author made in conjunction with Mr. Leon Dominion of the American Geographical Society. These maps have been republished with explanatory comments by the author in the *Geographical Review* for November, 1916 (pp. 354-60). They represent by colors the original distribution and subsequent expansion of the three European races. The text of the book is merely a commentary on the maps.

The first one shows the distribution of these races at the close of the Neolithic Age and the maximum prehistoric expansion of the Alpines in the Bronze Age (3000-1800 B. C.). It shows the migrations of the round-skulled Alpines (green) into Central Europe and how they submerged on the west and south the earlier dark-skinned long-skulled Mediterraneans (yellow) of Neolithic culture, whose earlier sites are marked by the megalithic monuments along the coast of Asia Minor, North Africa, the Atlantic to Britain. This map also shows the prehistoric Kurgans or monads of Russia and North Germany—these latter corresponding with the original habitat of the Nordics (pink). The Alpines have pressed upon the Nordics in the north and have introduced among them as well as among the Mediterraneans the bronze culture. So soon as the Nordics have learned the superiority of bronze implements and weapons over stone they begin to master their teachers as we see in Map II. This gives the expansion of the Pre-Teutonic or Continental Nordics (pink) from 1800-100 B. C. They have now submerged the Alpine area in Central and Western Europe. They have entered Spain and France, Britain and Ireland, with Celtic languages. Centuries later a second wave of them, Cymry and Belgæ, came from Scandinavia, took over these Celtic languages, drove off the earlier Gauls of France and Goidels of Britain and then, as Umbrians and Oseans, brought Aryan speech to Italy. As Achæans, Dorians, Phrygians and Cimmerians they entered the Balkans, Greece and Asia Minor; as Persians they crossed the Caucasus and as Sacæ and Massagetæ they passed around the Caspian into Turkestan and swarmed over the Afghan passes, bringing Aryan speech to India. In Central Europe they so completely submerged the Alpines—except in the mountainous and infertile districts—that the very existence of the latter was not suspected until our time, when it was discovered that the central core of Europe was occupied by a round-skulled short race originally from Asia. In Map III we see the Teutonized Nordics (red) and the Slavic Alpines (green) expanding from 100 B. C. to 1100 A. D. Now the Mediterraneans are diminishing in Central and North Europe and the Alpines are closely limited to the mountainous regions of Western Europe, though in Eastern Europe, as Slavs, they are slowly recovering their former position in two centers, north and south of the Danube. The Nordics are now thinly spread as the ruling military caste over both the Alpine and Mediterranean areas; they have everywhere pressed through the Roman Empire and laid the foundations of modern states. The last map shows the distribution of races to-day. Now the Mediterraneans are expanding once more—especially in the British Isles, while the Alpines of Central and Western Europe are recovering their position, having largely replaced the Nordics in the Balkans, South Germany, Austria and Russia. The Nordics are shrinking and are in full vigor only in North Germany and Scandinavia around the shores of the North and Baltic Seas, whence they still radiate in decreasing numbers. Sweden is to-day unique, in that here only is a complete unity of race, language, social and religious ideas. This Nordic shrinking began with the fall of Rome and only now, 1500 years later, are the Alpines once more claiming equality with the "master" race.

The reasons for the "passing" of the "Great Race" and the steady encroachment of the Alpines and Mediterraneans are manifold. To-day there are only ninety million people of Nordic blood in Europe out of a population of four hundred and twenty millions. In all parts of Europe outside its natural habitat the Nordic race is on the wane. The old acclimated populations of the Alpines and Mediterraneans are subtly reasserting their lost power through their high birth-rate and democratic institutions. The chief cause of the decline of Nordic blood is the wastage of war in the last two thousand years—the Crusades, the Religious wars (especially the Thirty Years war), the Napoleonic wars and the present world war. The menacing of the Nordic area by the Alpines west and north is indeed one of the causes of the present European struggle. All the states involved in it have sent to the front their Nordic element and the loss of life entailed is falling far more on the blond Nordic than on the other two races. From a racial point of view this is a suicidal war. Nearly all the officers and a large number of the fighting men are Nordics. The author points out that it is hard to say on which side of the struggle is the preponderance of Nordic blood. Flanders and North France are more Teutonic than South Germany; the backbone of the English and colonial armies as well as large portions of those of Russia are Nordic. The fourth map, already discussed, shows what the real lineup racially should be: Britain, North France, Northwest Russia, as Nordics, should be aligned with Prussia; while most of France, South Germany, and North Italy, large sections of Austria (Bohemia entire), most of Hungary, Roumania, Bulgaria, Greece and all of Serbia, as Alpines, should be aligned against them.

There are other reasons than wars for Nordic shrinkage. In recent centuries they have sustained severe losses by emigration to countries where they could not thrive. By nature they are adjusted to certain environmental conditions, such as protection from heat and sunlight. The fogs, cold temperature, moisture and long winter nights of North Europe make them thrive. Away from this environment—where they as to-day linger on as a land-owning aristocracy—they pine away and cease to breed. It was not only malaria but sunlight which caused them to disappear from Greece after the great classical period; there the Mediterraneans, naturally acclimatized, have finally caused them to disappear. The only Nordics in Greece of to-day are the members of the royal family. A third cause of the passing of the Nordics is the fact that they are less adapted to urban life than the Mediterraneans and so are succumbing under modern conditions resulting in the change from agricultural to manufacturing life. The Nordics thrive in the open, the Mediterraneans in the factories. They are furthermore suffering by selection through alcoholism—a peculiarly Nordic vice—and disease, especially consumption.

In America the author draws a peculiarly gloomy picture of the future of the Nordic race. He believes that this is due to a complete disregard, since the period of the Civil War, of the elementary principles of biology. The Civil War was fought by armies almost exclusively composed of Nordic blood—the native Americans. The prosperity which followed that struggle attracted newcomers and these, owing to American notions of the brotherhood of man and to the idea of "developing the country," were welcomed with outstretched arms. These newcomers were not exclusively Nordic: European governments unloaded the "sweepings of their jails and asylums" on us. The author fears that because of the future mixture of race the native American will utterly disappear; for he does not intermarry with these immigrants and he cannot compete with inferior races in sweat-shops. He finds that New York is a "cloaca gentium" "which will produce many amazing racial hybrids and some ethnic horrors that will be beyond the powers of future ethnologists to unravel." The only hope for the preservation of the Great Race in America, he thinks, is a thorough campaign of eugenics.

The "Great Race" is a great, even epic theme and it is treated in this book with almost Homeric boldness and simplicity. The author's literary brilliancy, force, directness and clearness of exposition, courage to state novel and startling positions—all make it a masterly production. But all these captivating characteristics are achieved at the expense of details. The book is merely an outline sketch. Great masses of facts and theories are compressed with almost epigrammatic brevity into a few pages. Consequently the chief impression on the reader is one of satisfaction, a feeling that great, intricate and age-long problems are finally solved. But the cautious student feels that the solutions are too simple. Reflection soon tells him that such problems cannot be so summarily dealt with, but still form and will continue to form a battleground among investigators of heredity, ethnology, anthropology, philology and history. The book contains little with which the specialist in all these fields is not already familiar. It is a book not for the specialist but for the general reader. It gives a most readable account of recent progress. There is hardly a reference to other books in it—outside of the bibliography at the end and the brief acknowledgment in the introduction to Osborn's "Men of the Old Stone Age" and Ripley's "Races of Europe." Probably it will call forth the greatest censure from students of heredity. In the field of anthropology the author has followed the latest authorities, but many of the positions held and discussed are certainly open to controversy. One feels that in the present unstable condition of many problems of anthropological science the book is too simple, too satisfying. It is doubtful if a German or French anthropologist would feel that the time had yet come to publish so dogmatic a treatise. One feels that the author's chief ability consists in giving us a great picture and that he is a man well fitted to follow up this picture with a work extending over many volumes. Such a work, fortified by masses of detailed proof, might well be the lifework of so brilliant a writer as the author.

The author's treatment of Italy and Greece will be of great interest to classical students. His idea that the struggles in early Rome between the Latins and Etruscans and between the patricians and plebeians were caused by the clashing of two different races, probably the Nordics and Mediterraneans, seems reasonable. To what extent the Mediterranean race entered into the blood and civilization of Rome cannot be definitely stated; however, the author seems right in ascribing the love of organization, the law and military efficiency of the eternal city, as well as the Roman ideals of family life, loyalty and truth, to the Nordic and not to the indigenous element. The Roman state, by the use of Nordic mercenaries, was able to keep the Western Empire alive for several centuries after the old Roman blood had practically disappeared and had become predominantly Mediterranean and Oriental. He believes the last Republican patriots represent the final protest of the old Nordic blood which had begun to flow over the Alps with the Umbrians and Oscars about 1100 B. C., and which introduced into Italy Aryan speech. By Augustus's day the old Romans had largely died out; the Roman slaves endured—the ancestors of most of the present Italians.

In Greece a similar history took place. The Mediterranean Pelasgians were gradually swamped by the Nordic Achæans who came down from the grasslands of Russia by way of Thrace about 1400–1300 B. C., though earlier wars may have come as early as 1700 B. C. These Achæans with their iron implements conquered the bronze-using natives. In Homer the Pelasgians and Achæans are still sharply contrasted. The same Achæan invasion brought related Nordics into Asia Minor as Phrygians, of whom the Trojans were the chief. When the Achæans and Pelasgians were beginning to amalgamate, new waves of Nordics, collectively known as Hellenes (Dorians, Æolians, Ionians), came and destroyed the Mycenæan culture of South Greece and Crete. This Dorian invasion was probably a part of the same movement which brought the Oscars and Umbrians into Italy. For centuries the old and new populations were in conflict, but out of it was evolved Classical Greece. The older Pelasgians were best preserved in Attica and Ionia. The Ionians stood for brilliancy, instability and the development of individualism; the Dorians, on the other hand, were more barbarous, and became military organizers, to whom the state was far more important than the individual. The author points out the same contrast between Prussia of to-day with its Spartan culture and France with its Athenian versatility. Thus in Greece there were two races; the older Pelasgians had evolved the Mycenæan culture; the later Nordic brought in an Aryan language and military ability. By 338 the Nordic blood had become so diluted by Mediterranean that Hellas became an easy prey to the stronger, more barbarous Nordic Macedonians. Still later this Macedonian blood in turn became mixed with Asiatic and finally ceased. The Nordic Greek states outlasted the others; thus Athens fell before Sparta, Sparta before Thebes, Thebes before Macedon.

It seems well attested that it was the contact of Nordic Hellene and Mediterranean Pelasgian which caused the "blossoming of the ancient civilization of Hellas," of the people which created more geniuses than all other races in a similar length of time. Thus the author says that Athens, with an average population of 90,000 freemen, produced between 530–430 B. C. fourteen geniuses of the first rank. We may also be quite certain that 2000 years later, when the Nordic invaders of North Italy had absorbed the art, literature and science of Rome, they "produced that splendid century we call the Renaissance." The fact that the chief men of the Cinque Cento—Raphael, Titian, Michelangelo, Leonardo da Vinci (he wrongly adds Dante to this century)—were of Nordic type (Gothic and Lombard) is, as he says, amply attested by portrait busts of North Italy, and this has already been made familiar to English readers by the great work of Howard Houston Chamberlain. We can also admit with the author that the sculptured portraits of the Persian Darius show us a man of pure Nordic type. The Achæan heroes at Troy, huge blond warriors, were as Nordic as the gods of Olympus, who were represented as fair and were largely imported into Greece by the Hellenes. Doubtless also the Greek painter painted Aphrodite (even though she was of Mediterranean origin) as blond, just as church artists now show us blond angels, while the denizens of the lower regions are uniformly represented as brunettes. Most modern painters have given us a blond Savior. However it does not follow that certain quasi-authentic traditions of Jesus's blondness indicate his " Nordic, possibly Greek, physical and moral attributes." Nor is it possible on the basis of portrait statues ascribed to Aristotle to predicate that the greatest of ancient thinkers was a Mediterranean because these busts show a small, long skull. All the so-called portraits of Aristotle—the Azara statue in Madrid, the seated one of the Palazzo Spada in Rome and the head in Vienna ascribed to him by Studniczska—are in dispute; probably the first one mentioned is that of a Roman poet, and the mutilated inscription on the second points to Aristippus and not to Aristotle. Equally absurd is it to jump to the conclusion that Diogenes and Socrates were un-Greek and "represent remnants of some early race, perhaps of Palæolithic man," and to adduce as testimony that each was recognized as somewhat alien by his countrymen. Alexander certainly had Nordic features—aquiline nose, yellow hair, clean white skin passing to red, as his Lysippan busts and the words of Plutarch attest. That his eyes were not blue but mixed, "the left blue and the right very black," thus typifying the Nordic conquest of the Near East, rests upon a very suspicious tradition.

With its few drawbacks the "Passing of the Great Race" is a masterly work. No one who starts to read it can lay it aside until he has finished it. Its chief merit is that it gives us a clear and comprehensive account of a vast and intricate subject. The captivation of its style and presentation inevitably reminds one of the great picture drawn over a half century ago by Professor Draper in his " Intellectual Development of Europe." This book will arouse anew the question of the relative parts played in human history by heredity and environment. The theory of Buckle's school has long since been shown to be false. Now we must consider original qualities quite as much as the impact of physical conditions on mankind. Geographers and ethnologists hitherto have paid too little attention to the one and too much to the other. Whether we accept Mr. Grant's estimates of the value to civilization of the three great European races or not, or whether we share his pessimism about the future of the greatest of them, especially here in America, still a study of his book will make racial and international problems far clearer than before, and show us the future method of treating history.

GEOGRAPHIC NEWS AND NOTES.

Awards of Geographical Medals.—The Geographical Society of Paris has awarded the Bonaparte-Wyse Gold Medal to Dr. Isaiah Bowman, director of the American Geographical Society of New York. This was in recognition of Dr. Bowman's work in South American geography.

The American Geographical Society of New York on April 10 awarded the Cullum Geographical Medal to Major-General George W. Goethals, in recognition of his work in the building of the Panama Canal. The Charles P. Daly Gold Medal was awarded to Professor George G. Chisholm, lecturer in geography in the University of Edinburgh, in recognition of his many contributions to the science of Commercial Geography. As previously announced in the *Bulletin* (April, 1917), the American Geographical Society awarded the David Livingstone Centenary Medal to Theodore Roosevelt because of his explorations in South America and in Africa.

The Geographical Society of Philadelphia bestowed its highest award, the Elisha Kent Kane Gold Medal, upon Dr. Wm. Curtis Farabee in recognition of his pioneer explorations in Amazonia.

The Société de Géographie of Quebec has awarded its highest prize, the Conrad Malte-Brun Gold Medal, to Dr. John H. Finley, president of the University of the State of New York, in recognition of "the exceptional interest and high merit of his volume, 'The French in the Heart of America.'"

At a recent meeting of the Royal Geographical Society the president, Mr. Douglas Freshfield, announced that the king had approved of the award of the Royal Medals for the present year as follows:

The Founders' Medal to Commander D. G. Hogarth, for his explorations and other geographical work in Asiatic Turkey, 1887–1911.

The Patrons' Medal to Brigadier-General Rawling, for his explorations in western Tibet and Rudok, 1903; his journey from Gyanste to Simla via Gartok, and his exploration in New Guinea, 1908.

The Victoria Medal is awarded to Dr. J. Scott Keltie for his eminent services to geography during his secretaryship of the society.

The other awards are as follows:

The Murchison grant to Rai Bahadur Lal Singh for his devoted work as surveyor to the expedition of Sir Aurel Stein.

The Back grant to the Rev. Walter Weston for his travels and explorations in the Japanese Alps—a district previously unknown to Europeans.

The Cuthbert Peak grant to Dr. A. M. Kollas for his explorations and ascent of new peaks in Sikkim and his investigation of the effects of high altitude.

The Gill Memorial to Mr. E. C. Wilton for his geographical work in southwestern China.

The MacMillan Expedition.—On June 5 Dr. Henry Fairfield Osborn, president of the American Museum of Natural History and chairman of the Crocker Land Committee, received word from Donald MacMillan, by way of Copenhagen. The message was dated February 15, 1917.. It read: "All well at Etah headquarters, Crocker Land expedition. Relief ships of 1915 and 1916 failed to reach us. Dr. E. O. Hovey and Captain George Comer arrived by powerboat from North Star Bay in September. Will spend year with us. Hunt and Ekblaw proceeding home by way of South Greenland and Copenhagen. Have good warm house, plenty of fuel and adequate supply of food until August 1917. A third ineffectual attempt at relief will compel us to resort to Eskimo mode of living—an igloo for shelter, skins for clothing and meat for food.

"Plans for 1916 trip carried out successfully. Left Etah March 22 with seven Eskimos, eight sledges, eighty dogs for exploration of Finlay Land, the King Christian island of Sverdrup. This land was seen about sixty-four years ago by Franklin search expedition, but as far as I am able to learn has never been visited by white men. Plan to go light, go fast and live largely upon resources of the country, in order to get back before Smith Sound breaks out in spring. Crossed Ellesmere Land by old Eskimo pass, ascending river-bed at the head of Flagler Bay to height of land, thence to height of glacier to altitude of 4,000 feet, descending into the head of Bay Ford.

"Passed through wonderful game country—wolf, caribou, musk ox, seal, hare, ptarmigan, lemming, fox and polar bear. Sledging surfaces throughout trip excellent. Secured sights for longitude and latitude at all important points, also line of azimuths from 73d meridian across magnetic meridian to 103d. Much coal all through this region.

"Evidence of recent uplift of land on all shores. Large numbers of bears and musk ox, kept dogs in good condition. Two sledges sent back to headquarters with specimen skins for American museum from Eureka Sound and two from Cape southwest of Axel Heiberg Land. Game failed, however, from 97th meridian on.

"Reached Finlay Land April 19, twenty-nine days from Etah. Slopes very low with gentle slopes toward interior, culminating in mountain peaks 2,000 feet in altitude. Tracks of caribou, lemming and fox seen. Two days heavy wind drift prevented us from hunting, or from making extended observations or survey of coast line. On 23d weather cleared sufficiently for me to obtain good sights for latitude, longitude and azimuths. Compass needle at last camp pointed almost due south. Lack of dog food compelled retreat.

"On the return swung south for exploration of North Cornwall, which was seen in about 1850. Tracks here of musk ox, wolves and caribou. Mapped northern, eastern and southeastern shores of Finlay Island; much larger than recorded and very different in shape. Discovered five islands off its shores; also good-sized island off eastern coast of Amund Ringnes Island, in latitude 78 degrees 18. Built cairns and inclosed records at all prominent points on the trip. Many seals on the ice on the return furnished plenty of meat. Reached Etah May 15, crossing from Victoria Head to Anoritok. Time, fifty-six days; 1,350 statute miles.

"Members of expedition have done good work in botany, geology, glaciology, ornithology, ethnology, archeology, photography and meteorology. Very fortunate in securing two sets of eggs of the knot, which were found by Doctor Hunt at Umanak. Captain Comer has obtained some very favorable results in archeology at Umanak; he will continue his work at Etah and vicinity until the arrival of the ship in 1917.

"Doctor Hovey has begun work in geology, seismology and glaciology. Extensive plans for future exploration in spring, work to begin about March 1. I can have large number of dogs, walrus meat for food, whole wheat biscuit and pemmican for trail. Sun now well on way south, having left us on October 24 for 118 days. Men all happy and confident of good health."

Upon receipt of the message it was planned to send the *Neptune*, of the Newfoundland sealing fleet, to the rescue, leaving St. John's July 5 in command of Captain Robert A. Bartlett. The members of the expedition now at Etah are Donald B. MacMillan, Dr. Elmer Ekblaw, Captain George C. Connor, E. D. Hovey, Dr. J. Harrison Hunt and J. C. Small.

Annals of the Association of American Geographers.—The last volume of the *Annals*, recently from the press, contains three leading articles of interest. The first, on "Some Problems of Geographic Education," the presidential address of Richard E. Dodge, is an admirable statement of the aim of modern geography in secondary schools. A second article by Robert DeC. Ward is on "The Prevailing Winds of the United States." This contribution is a remarkably clear account of wind conditions in the U. S. for various seasons, and describes in a most suggestive manner the economic value of winds in various parts of the country. The third and most important article is the one dealing with "Physiographic Divisions of the United States," by N. M. Fenneman. For many years geographers have longed for a definite delimitation of the natural physical divisions of the U. S. that could be used by all workers in the fields of the natural and social sciences. Steps were first taken toward this end by the appointment of a committee by the Association of American Geographers, of which Professor Fenneman was chairman, and this article is essentially the findings and recommendations of this committee. The article is accompanied with a large colored map showing the divisions described in the text. There are eight major divisions, following in general the divisions heretofore used by physiographers, viz.: (1) Laurentian Upland; (2) Atlantic Plain; (3) Appalachian Highlands; (4) Interior Plains; (5) Interior Highlands; (6) Rocky Mt. System; (7) Intermontane Plateaus; (8) Pacific Mountain System. Each of these "divisions" are subdivided into provinces, 24 in all, and these in turn are further subdivided into "sections." The great value of the work consists of accurately defining the boundary lines separating these major and minor divisions. The committee was not in complete agreement as to divisions and boundaries, but the disagreements are in minor matters. Unquestionably this division in its main outlines at least will become the working base for students who recognize the need of such physical divisions and desire to standardize the results of workers in all fields where the influence of physical form to life is the dominant study.

World Agriculture.—The newly issued Handbook of the Department of Agriculture contains "A Graphic Summary of World Agriculture," by V. C. Finch, O. E. Baker and R. S. Hainsworth, giving a series of maps showing distribution of world crops in a form similar to the Graphic Summary of Agriculture in the United States published in the 1915 Handbook. The method of representation is the dot method, each dot representing a certain number of acres or bushels or number of animals. Wheat, corn, oats, barley, rice, cotton, flax, tobacco, potatoes, sugar, coffee, horses, mules, cattle, swine, sheep, and goats are shown. Each map contains a segmented circle showing percentages of production by countries, and line drawings comparing the principal producing countries for each crop as to acreage, absolute yield, yield per acre, yield per capita, per cent. of land in the particular crop, etc. The series of maps presents an enormous amount of information in a short space but in a manner so graphic that at a glance the eye can take in the great facts of world distribution. The article can be obtained from the Department of Agriculture as year book separate, No. 713.

The World Supply of Cloves.—An interesting adaptation of a crop to geographic and economic conditions is found in the clove industry of the two small islands of Zanzibar and Pemba, off the east coast of Africa. According to *Commerce Reports* of June 11 over 90 per cent. of the world's supply comes from these two islands, averaging in value $2,500,000 per year. The clove tree was introduced into Zanzibar from the Moluccas over a century ago, and soon came to be not only the chief dependence of the Sultanate, but the great source of supply for the world of this spice. The export in 1915 was 12,500 tons, produced on 3,700,000 trees covering 54,000 acres of land. The clove tree is said to be especially sensitive to climatic and soil conditions. In Zanzibar, meteological and geological conditions seem to form an ideal combination for the clove. Added to these geographic factors, however, is the one of labor, since clove culture requires expert management and handling. In Zanzibar the labor is not only efficient for this purpose, but it is also cheap. The management of the industry is in complete control of the Arab, who through long experience know how to produce and are especially qualified to handle the native laborer.

Malaria in the United States.—One of the greatest scourges of mankind is malaria, and yet our public officials—national, state and local—have been strangely remiss in dealing with it. In fact, accurate information as to the geographic distribution of malaria in the U. S. is impossible to obtain. Two recent pamphlets are of especial interest, therefore, in summarizing our knowledge concerning the disease. Reprint No. 382 from the Public Health Reports by John W. Trask (Washington, Government Printing Office, 1917) treats of malaria as a public health and economic problem, and a booklet by Frederick L. Hoffman (Newark, Prudential Insurance Co. of America, 1917) is "A Plea and a Plan for the Eradication of Malaria throughout the Western Hemisphere." There is probably no state in the Union in which malaria is not present, but there are three principal well-recognized endemic areas shown on the map of malarial distribution accompanying Dr. Trask's article. The largest of these areas covers all the southern states from eastern Texas to the Atlantic and from the Gulf to the latitude of northern Maryland. A smaller area includes northern New Jersey, southeastern New York, Connecticut, Rhode Island and a part of Massachusetts. The third area includes the Great Valley of central California. There are many small endemic areas scattered here and there throughout the remainder of the United States.

"Among the endemic diseases of our southern states malaria ranks first in the order of practical importance, and the amount of suffering caused by it and the social and economic losses resulting from it far exceed those of all the other diseases, including pellagra and hookworm." Conservative estimates place the annual economic loss in the United States at not less than $100,000,000. Because of climatic and topographic conditions, the southern states are naturally the most afflicted. Dr. Hoffman's statistics show that certain areas in the south are among the most afflicted areas in the world. For example, the death rate from malaria in Greensville Co., Va., on the swampy coast plain, is 130 per 100,000 of population; in Dunkin Co., Mo., on the low flood plain of the Mississippi, it is 297.7 per 100,000. Sunflower Co., Miss., has a rate of 306. This latter is higher than Venezuela, with 305.6. These high rates are exceeded by only a few countries for which we have statistics. The island of Mauritius, with a malarial death rate of 1,176.9 per 100,000, leads the world. Nicaragua, with 727.5, stands very high. The rate for the Philippines is 397.5; for the Panama Canal Zone 140; for Porto Rico 81.1; for Costa Rica 62.6; for Cuba 21.9; for Italy 10. It must be remembered, however, that in these comparisons we are taking local areas of high infection in the south and comparing them with whole countries, some of them, as the Latin American countries, with very unreliable statistical information.

The malarial death rate in some of our cities compares unfavorably with that of many cities in the Tropics. Savannah, Ga., with 78.6 deaths per 100,000 has a mortality nearly 4 times as great as that of Manila, with 20.6 per 100,000. Memphis, Tenn., with a rate of 74.2, Mobile, Ala., with 60.4; Wilmington, N. C., with 40.3; Jacksonville, Fla., with 34; Charleston, S. C., with 30.9 are all high when compared with Rio Janeiro with 20.7 or Habana, Cuba, with only 2.4.

In spite of this surprising high occurrence of malaria in the United States, its prevalence has greatly diminished both in area and in intensity. Fifty years ago the endemic area extended to the Great Lakes and into Canada. The northern boundary has gradually receded, leaving here and there more or less localized endemic foci. Malaria is also diminishing in many localities in the south, due largely to the improved economic status of the farmer, the more extensive cultivation of the land and improvement in medical treatment. That 80 per cent. of the present cases could be eradicated by the application of known precautions is the belief of the experts, and that the country continues to suffer from the ravages of the disease is largely due to short-sightedness and carelessness.

Ecological Society of America.—The first meeting of the newly formed Ecological Society of America was held last December at Columbia University. The officers elected were: President, Dr. Ellsworth Huntington; Vice-President, Dr. J. W. Harshberger; Secretary-Treasurer, Dr. Forrest Shreve.

Is the New Jersey Coast Sinking?—The long-held belief that the coast of New Jersey has been slowly sinking has been seriously questioned by the more recent observations of Prof. D. W. Johnson. Professor Johnson's first studies were largely concerned with the physiographic evidence of stability, particularly the present position of the old beaches which lie, as at Atlantic City, back of the present beaches and were apparently formed with the relative position of land and sea the same as it is to-day. In the February, 1917, *Geographical Review*, Professor Johnson summarizes the further evidence that the coast line is remaining stationary. A re-survey of the precise levels for Atlantic City, Cape May and Vineland in the southern part of the state in 1912 showed essentially no change since the first survey of 1886. In 1915 similar surveys in the northern part of the state show no change in elevations, and precise leveling made about New York harbor by the chief engineer of the City of New York show no appreciable changes in level at Sandy Hook, Perth Amboy and points in New York and Long Island. All the evidence of recent studies is in favor of a stable coast during the last 25 years at least.

The National Geographic Society has set aside $12,000 to finance another expedition to Alaska in order to obtain full information in regard to the eruption of Mt. Katmai. The expedition will be in charge of Professor Robert F. Griggs, of the department of botany, The Ohio State University.

Dr. Ellsworth Huntington, who resigned from Yale University three years ago to devote his entire time to research work, has been appointed Research Associate in Geography at the same University, and will begin his work at New Haven with the new academic year. Dr. Huntington's work will continue to be primarily research work, especially along the line of climatic influence and the causes of climatic changes, but he will probably also give one course for graduate students.

ACTIVITIES OF THE SOCIETY.

A timely address, in view of the cultivation of social sympathy and commercial interest with South America, was that of Charles Wellington Furlong, F.R.G.S., the noted traveller and author, on Wednesday evening, April 4. Mr. Furlong took for his theme "Chili and the Fuegian Archipelago," and his word-pictures were supplemented by excellent lantern-views.

Sir Ernest Shackleton addressed an audience that filled the Academy of Music under the auspices of the Society on the evening of Wednesday, April 25. He described the journey on which he left England, under the king's orders to proceed, on July 29, 1914. On October 27, 1915, his vessel, ***The Endurance***, was forced to surrender in the unequal combat with the Antarctic ice. For five and a half months the little company drifted on an iceberg, sleeping in one another's arms to keep warm, before reaching Elephant Island, whence the rescue was finally effected after repeated attempts under circumstances of almost unprecedented difficulty and peril. Sir Ernest was especially careful to ascribe all possible credit to the gallant men of his command—Frank Wild in particular, and A. H. Ninnis, whom he brought upon the platform. He announced that the name of his generous friend, John H. McFadden, of Philadelphia, had been bestowed upon a portion of the new land discovered.

"Alaska" was the theme of Howard W. Dubois, consulting mining engineer, on Wednesday, May 2. Mr. Dubois showed not only colored slides but remarkable motion pictures depicting the whaling industry, hydraulic gold mining and extraordinary rich copper mining, the birth of icebergs at the famous Childs Glacier, a tidal wave at the head of Cook's Inlet, sea-lions leaping from rocks into the ocean, the eruption of Mt. Katmai in 1913, close-range views of the large moose and bear of the Kenai Peninsula, and other features characteristic of the life and the industries of Alaska which Mr. Dubois described from intimate first-hand acquaintance. The speaker declared that the value of the territory was only beginning to be realized.

ELECTION OF OFFICERS.

The annual election was held May 2, and resulted as follows: *President,* Mr. Henry G. Bryant; *First Vice-President,* Prof. Emory R. Johnson; *Second Vice-President,* Miss Laura Bell; *Recording Secretary,* Dr. J. E. Burnett Buckenham; *Corresponding Secretary,* Dr. Paul J. Sartain; *Treasurer,* Mr. William K. Haupt; *Directors,* Dr. Clement Biddle, U.S.N., Dr. William Curtis Farabee, Mr. Howard Fuguet, Miss Mary S. Holmes, Mr. Samuel Scoville, Jr., Mr. E. Marshall Scull, Mr. Howard Longstreth (to fill the unexpired term of Prof. Emory R. Johnson); *Excursion Committee,* Prof. H. C. Petersen, Mr. S. L. Schumo, Mr. William Paxson String, Miss Emma L. G. Thomas; *Reception Committee,* Miss Catherine A. Bond, Mrs. J. Bertram Lippincott, Mrs. P. F. Rothermel, Jr., Mrs. Jones Wister.

BOOK NOTES AND REVIEWS.

Bowman, Isaiah. *The Andes of Southern Peru.* Pp. xi + 336. New York, Henry Holt & Company for the American Geographical Society of New York. 1916.

This first of the monographs to be issued by the American Geographical Society in New York sets a very high standard for all subsequent publications in the series, and at the same time stands out as one of the most notable contributions to geography in the United States. Both the author and the Society are to be congratulated on the completion of this work, for it is a model after which other regional studies might well be patterned.

The author has been most fortunate, of course, in having to deal with a comparatively little known and even partly unexplored area, which at the same time shows as striking contrasts of geographic conditions as could be found anywhere within similar limits, and he does full justice to the opportunities which this fascinating area affords. It is fortunate, too, that the author has been wise enough to divide the discussion into two parts. The first, Human Geography, gives him a chance to interpret in a body the reactions of man to his environment under widely different conditions; and the second part, The Physiography of the Peruvian Andes, combines the more detailed and technical exposition of the inorganic aspects of this environment. In this way, the life relationships are made to stand out much more clearly and effectively than by any other possible method, and at the same time the physiographic and geologic contributions are clarified and more readily stated as though an attempt had been made to combine with them a discussion of influences on life conditions.

Any reader, familiar or not with the modern science of geography, can read the first part of the book with uninterrupted interest and very great profit, for therein are illustrated a great many of the fundamental principles of the whole subject. The second part is somewhat more technical and perhaps cannot be read with the fullest profit by one who has not had some training in physiography, but even the lay mind can not fail to grasp the main facts, since they are stated so clearly and logically.

With so much merit to commend, it is not a simple matter to pick out those aspects which are most worthy of particular mention. In any event, however, one must compliment the author on his remarkably effective introductory chapter, wherein the aspects of the four regions of Peru are presented by native dwellers in those areas. In this way the reader is given at the very outset not only a bird's-eye view of the main problem of the monograph, but also a most effective insight into the personality of the Peruvian native. The effectiveness of the style in this first chapter is sustained through the others to such a degree as to make it the kind of reading which one puts aside with reluctance and resumes again promptly at the first opportunity. A very good example of this quality is found on pages 68 and 69, where the description of the border valleys of the eastern Andes gives a most vivid impression of the region.

It is also worthy of note that the author has employed a scheme of diagrammatic representation of geographic phenomena which is very satisfactory. Such diagrams, of which Fig. 26 is typical, offer to the student and investigator in geography a means of portraying a great deal in a simple fashion. In fact, the demonstration of the usefulness of this method of showing the distribution of geographic phenomena is perhaps one of the important contributions which the monograph has made. Something similar to it has been used by others, particularly in physiographic studies, but the reviewer knows of no case where it has been worked out so thoroughly for the distribution of physiographic conditions and their life relations.

A third praiseworthy point is the manner in which the data are analyzed from various angles. This practice is manifest in both parts of the volume, but perhaps most strikingly in the first part, where it is necessary to evaluate not only the influences of environment on the life of the region, but also the influences of various non-geographic factors. In this respect the author has set a model, which others may follow profitably, as illustrated particularly in the interpretation of the country of the shepherds, which is found from page 50 forward. In this section, where the author undertakes to answer the question of distribution of the Indians of the mountain zone, he gives a good example of the geographic method of investigation.

The collection of meteorological data, in Chapter X, and the discussion of the climatology of the Peruvian Andes are most welcome additions to a previously somewhat meager literature in that field. In the chapters on the physiographic and geologic development of the Peruvian Andes, and the glacial features of the region covered, the author also makes substantial additions to the knowledge of the region and offers some new interpretations for old data, not the least of which perhaps are the suggestions concerning the work of snow in the development of glacial cirques. In fact, the book to the very end is so generally good that one is tempted to cease specifying and commend it bodily with unstinted praise.

A final word, however, must be said concerning the number and quality of the illustrations. These are of various sorts. The half-tones which are scattered through the book, but which are most numerous in Part I, are of invariably high quality and very effectively supplement the accompanying text. The line drawings, already referred to as an illustration of a method of presenting geographical material, are most precise and satisfactory in every instance. The graphs, found particularly in connection with the meteorological and climatic data, are well done, and very welcome additions. And last, and perhaps most of all, one must praise the topographic maps which are included, because of the general unavailability of such maps for that part of the world, the perfection of those which are here given, and the great difficulties which were overcome to make them. Perhaps the best sample is that which faces page 120 and shows the characteristic topography of the coast zone of Peru in the vicinity of Camaná.

Taking it all in all, therefore, the monograph is complete in text, in illustration, in bibliography and in index—put together with such thoroughness and keen appreciation of the methods of effective presentation as to make it a most notable addition to the field of geographic literature, and a most satisfying volume for any one who wants to know about the life of Peru or the conditions of existence in a tropical land.

UNIVERSITY OF CHICAGO. WALTER S. TOWER.

Calvert, Amelia Smith, and Calvert, Philip Powell. *A Year of Costa Rican Natural History.* Pp. xix + 577, illustrated. New York, The Macmillan Company. 1917. Price $3.00.

Because of the popular interest in insects and also because the greater part of a country's fauna consists of insects, it would seem that those who describe nature should have even more than an elementary knowledge of entomology. Professor Calvert most certainly has not only this but he speaks with authority of other branches of natural history as well. Furthermore, he and Mrs. Calvert do not write of a mere "go, look, and come back" but of a year's residence, of which they say: "Our primary concern in Costa Rica was a study of the dragon flies with reference to their seasonal distribution, which necessitated visits to the same localities at different times throughout the year, and our movements within the country were mainly for the purpose of carrying out that plan. Our investigations have not yet been completed and we have little to say in these pages on that technical subject. What we here set forth are chiefly our more incidental observations recorded in our diary."

This book is free from the blemish of too many stories of hardships, stories so apt to leave the impression either of fiction or of a poor traveller. The only serious mishap was the 1910 earthquake, which destroyed Cartago. Naturally, Professor and Mrs. Calvert were not to blame for this and happily they escaped, although narrowly, with their lives and almost all of their specimens. This interesting episode, which came as a climax at the close of their work, is graphically described. The main body of the book gives the reader a good picture of man and nature in the American tropics, not overdrawn and sufficiently complete as to text and illustrations. A long list of selected literature, relating chiefly to the natural history of Costa Rica, is given and also several maps, the large one being based on that of H. Pittier. The detailed index adds to the book's usefulness.

AMERICAN MUSEUM OF NATURAL HISTORY. FRANK E. LUTZ.

Taylor, Griffith. *With Scott: The Silver Lining.* 464 pp., illustrations and maps. New York, Dodd, Mead & Co. 1916. $5.00 net.

The complete story of Scott's last tragic expedition has not before been told. The published diary of Scott has given us the main events of the journey, but it has been left to Mr. Griffith Taylor, the geologist of the Expedition, to give us the completed story in this large and attractive volume. What Scott might have said had he lived to write the story is here told in popular, intimate fashion, making a book of exceeding great interest as a record of exploration and adventure as well as for its scientific content.

Many of the chapters are given up to the story of the men and events that made up the expedition. These chapters are a rather unusual mixture of the record of the daily life of the party, of scientific observations, of diagrams both humorous and instructive. However, the many pictures of the intimate life of the party, the recording of the apparently trifling events that made up the daily life of the members of the expedition in their winter quarters, gives spice and interest and will make the book appeal to all who admire the adventures of red-blooded, strong men, simply and naturally carried out. The author is physiographer to the Commonwealth of Victoria and was selected as geologist of the expedition because of both his scientific and personal qualities. He was with Scott until the Polar Party left Cape Evans for the final Polar dash and Chapter V, "In Winter Quarters with Captain Scott," gives a very intimate picture of this gallant explorer.

Mr. Taylor was selected by Scott to head two exploring expeditions from the winter-quarters camp. These expeditions, the first western, January to March, 1911, and the Granite Harbor Expedition, November, 1911, to February, 1912, are described in Chapters IV and VI, and constitute the chief scientific portions of the book. These expeditions studied the glaciers and geologic features of the edge of Antartica to the west of Cape Evans, in the region of MacMurdo Sound, and have resulted in the preparation of a topographic map, reproduced in this book, of a hundred miles of coast line, 10 to 15 miles inland. The map on a scale of 5 miles to the inch shows the details of topography, glaciers and coast line from Mt. Discovery to Granite Harbor. Models of the section have also been prepared and are reproduced in the book. The descriptions of glaciers and glaciation along this continental edge are of great interest and value to glacial science.

The book is very fully illustrated from beautiful photographs, and the text is liberally interspersed with drawings and sketches made for the most part by the author. The book will stand as one of the important contributions to Polar exploration and science.

Wilcox, Earley Vernon. *Tropical Agriculture.* Pp. 348, illustrated. New York, D. Appleton & Co. 1916. $2.50 net.

Written for the "general reader," business man and agricultural student, this book attempts to present "what everybody ought to know about the Tropics." Importations of tropical products into the United States, we are told, amount to more than $600,000,000 annually, one third of the total importations, and the utilization of tropical plants is being rapidly extended through the development of science, transportation, and improved economic conditions. Not only are we importing foods and raw materials from the tropics but the United States is becoming an important producer of tropical products through its possessions in the Philippines, Porto Rico, Hawaii, Samoa, Guam and the Canal Zone.

This book consists of two parts. The first five chapters (42 pages) deal with general considerations—Tropical Climate; Tropical Soils; Agricultural Methods Peculiar to the Tropics; Economic and Social Conditions. The remaining and much the larger part of the volume is a general account of 350 tropical products, their nature, distribution, methods of cultivation, commercial uses and importance.

Although intended to be an account of tropical conditions in general, the book very strongly shows the influence of the author's personal experience, in that very much of the account centers around the Hawaiian Islands, where for six years the author was in charge of the Government Experiment Station. For example, the tropical climate described is Hawaiian climate for the most part, agricultural methods as used in Hawaii are emphasized, and Hawaiian crops are given space out of proportion to their relative importance. In spite of this shortcoming, however, the book is a distinctly valuable one, both as an account of tropical conditions of agriculture and for the large amount of information it imparts concerning the crops discussed. Teachers of geography should find it an excellent handbook, and all who are interested in knowing the origins and means of production of the many things in daily use that come to us from the tropics will find the book readable and entertaining. An excellent bibliography on books and periodicals dealing with tropical agriculture is appended. The book is well illustrated with half tones.

Pinkerton, Kathrene G. *Woodcraft for Women.* 174 pp. New York, Outing Pub. Co. 1916. 80 cents net.

Two classes of women will find profit and pleasure in Kathrene Pinkerton's recent book: those who have slept in a tent, and those who have longed to but have been denied the privilege. The pages are packed with advice to women campers taken from the author's own experiences during four years' out-of-door life in northern climates. The list of chapters includes clothing, cooking, camp making, paddling, hunting, "going alone," and camp courtesy. Clothing and camp cookery are especially well treated. It is a handbook worthy of a place in the pack of a seasoned camper, while it makes the novice long for heel-less shoepacs. A. H. R.

Johnson, Emery R. *The Panama Canal and Commerce.* Pp. 296, illustrated. New York, D. Appleton and Co. 1916. $2.00 net.

This book is the third in a series of which the first two are Gorgas, "Sanitation in Panama," and Sibert and Stevens, "The Construction of the Canal." It is "intended to explain why the canal was built, and to discuss the use of the waterway by the commerce and shipping of the United States and other countries," and "is addressed to the man engaged in shipping and also to other students of the canal in relation to commerce."

If I have interpreted Professor Johnson's outline correctly, there are treated four main topics which, with their approximate percentages of space, are (1) Why the Canal was Built—16 per cent.; (2) Effects of the Canal—42 per cent.; (3) Comparison with Alternative Routes—14 per cent.; (4) Tolls, Tonnage Rules, and Commercial Administration—24 per cent. In addition there is a final chapter on the effects of the Culebra slides.

The treatment of the first topic is rather unsatisfactory. The reasons for the construction of the canal are given in several places (pp. 1, 7, 11–23, 68, 112) and differently each time, so that the reader does not obtain a clear conception of the factors involved. Moreover the explanation of the time and distance saved by the canal is not particularly good, partly because of the fact that the comparison with alternative routes is deferred until later; partly because of lack of statistical tables; and partly because of incomplete statement in certain places. As an illustration of the latter fault there may be mentioned the omission (pp. 26–27) of tolls from the partial list of factors influencing the choice of ocean routes. In the reviewer's estimation Hutchinson's "The Panama Canal and International Trade Competition" is a better source of information on this topic.

The discussion of the effects of the canal is brought up to date by the inclusion of statistics of traffic through the canal during the first thirteen months of operation and of a list of the "line" services through the canal at the time of closure by the Culebra slide. This is perhaps the most valuable part of the book, for even in those cases where the author has found it impossible to judge of the effects of the canal by performance, he has outlined a helpful analysis of the probable effects.

The fourth topic concerns the tolls, tonnage rules, and commercial administration. To the student of commerce the detail of this portion of the book probably will seem unnecessary and tedious, especially as the author's outline is in some places difficult to follow (pp. 236–9, for instance).

The volume is admirably free from errors and exaggerations, as acquaintance with Professor Johnson's earlier writings would lead one to expect. As indicated above, the outline and relative importance placed on different topics are not altogether satisfactory, but these faults are not serious enough to keep the volume off the bookshelves of every one interested in international trade.

THOS. R. TAYLOR.

NORTHWESTERN UNIVERSITY.

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PLATE I. MOUNT SHASTA.

WITH CAMERA IN THE CASCADES.

CHAS. A. GILCHRIST.

It is very nice to be sitting next the open window of the last car in a long train of Pullmans which is puffing a tortuous way through fine mountain scenery. Especially is this so if one has slept well, breakfasted well in a luxurious dining car, and finds the beautiful Sacramento River mostly upon his side of the train. The fascination of watching the graceful body and puffing head of this great railway serpent is a boyish joy that never seems to grow old. There is a sense of steady irresistible power about the great locomotive, now quite invisible to the left, now in full sight across a sweep of river to the right, now plunging into the dark opening of a tunnel and always connected with us by the sinuous perspective of curving train and road bed. I was speculating thus, upon the ease and comfort of penetrating what, without the railroad, would be a very difficult wilderness to explore, when the train swung into a long straight reach of the valley, down which appeared Mount Shasta.

By noon the train had, with the help of an extra locomotive, climbed out of the river canyon and approached as near the great mountain as the railway goes. In point of luxury the town of Sisson is the antithesis of the Pullman train. The town proper is a solid block of saloons strongly reminiscent of the Nevada mining town we read about. This block is known as "Whisky Row." But a moment's walk in any direction brings one into beautiful farm and pine wooded country with a circle of mountains round about, culminating in white Shasta, vastly larger than all the others.

The very first morning of my rambles with the camera I was treated to the unusual,—a magnificent cumulous cloud rising directly behind and high above the mountain. I was already "set up" and browsing around the hay fields when the cloud first appeared and almost at the same time I noticed that there was a hay cart being loaded in a neighboring field. For the next hour I was very busy. The position and shape of the cloud made it difficult to believe I was not witnessing a volcanic eruption. Of course the unusual does not necessarily make a picture, but here at least was a possibility and it called for both quick and calm action. The cloud would of course change rapidly in ways which could not be foreseen, and the men gathering hay, whom I wanted for a foreground, were not so interested in my work as to give up their own to pose for me. There were three things I did. First I exposed a picture every little while as the cloud expanded in order to be sure that one at least would show it at about its best. Second, I kept moving my position from time to time in order to follow the cart and keep it in line with the mountain and at a proper distance. Third, I used a lens of wider angle than I would have selected had there been time to change and try lenses, thus being sure not to lose any portion of the scene through careless pointing. As it turned out, the best composition covered only about half the plate, and this I subsequently enlarged up to the standard size of my other prints,—an operation that would not have been necessary had there been plenty of time in the field for focusing and changing lenses.

The big peaks of the Cascades are Shasta in California and Rainier in Washington, with all the state of Oregon and the Columbia River in between. To the mountain climber Rainier is by far the more attractive of these two peaks by reason of its much heavier mantle of snow and ice, and the greater ruggedness that this implies. Between these two are the "Guardians of the Columbia"—Mount Hood, Mount Adams, and Mount St. Helens, which are inferior in altitude although they possess magnificient snow caps and real living glaciers such as are not to be found on Mt. Shasta.

But in travelling north from San Francisco to Seattle on the railway, one does not pass so near to these other peaks as he does to Mount Shasta. In the best of weather they may be seen in the distance if the traveller is on the lookout for them. The distant view of Mount Rainier from Puget Sound is renowned. Sometimes the lower part of the mountain is quite invisible in a purple stratum of haze and when the eyes are raised above this the glistening white ethereal top is seen, apparently floating unsupported in space. In a photograph of such a distant view the mountain would quite naturally be of insignificant size, but by using a long focus lens, or a telephoto lens we can make the image of the mountain large enough to fill up more of the picture, at the same time eliminating much expanse of the horizon that is not wanted. As between a distant

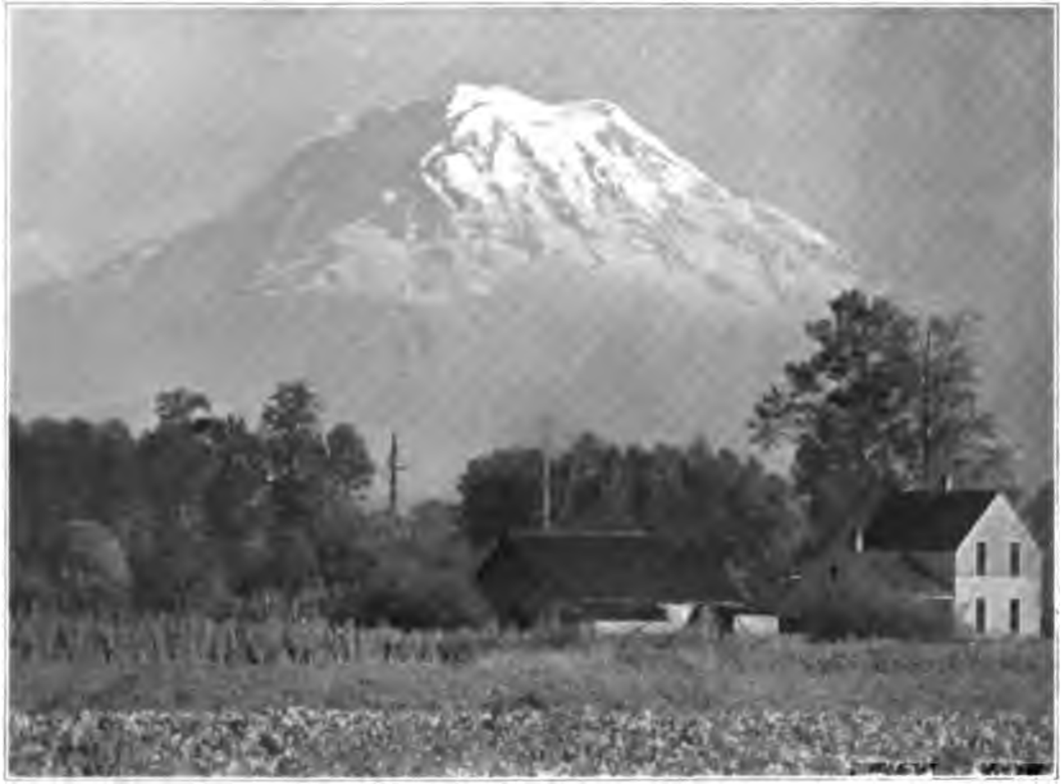

Photo by C. A. Gilchrist.

Plate II. Mount Rainier from Puget Sound Telephoto.

Photo by C. A. Gilchrist.

Plate III. "The Shasta Limited."

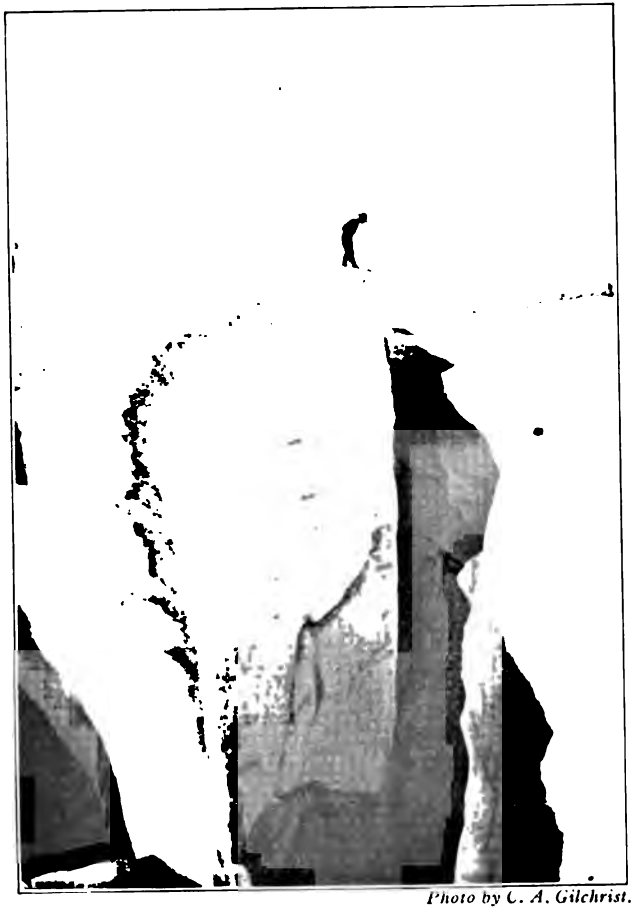

Photo by C. A. Gilchrist.

Plate IV. The World of "Living Ice," Mount Hood.

view and a near view of the same mountain in each of which the image is of about the same size, the distant view is usually the more impressive and indicates more correctly the proportions of the relative parts of the mountain. As seen from Puget Sound Mount Rainier often glows for some time after sunset, gradually turning from white to various shades of pink as rich and beautiful as the famous " alpine glow " on the Jungfrau as seen from Interlaken.

Not only in its ice mantle is Rainier superior to Shasta but also in its forest cloak. Perhaps it is that the forests here seem wilder and more primeval. The huge fir trees grow close and dark and enormous half decayed trunks are flung across each other in a wanton wastefulness not to be associated with the puny economics of man. Everything is dripping, dank, and mossy and the profusion of rich undergrowth suggests the luxuriance of tropical jungles. The beauty of such a forest seems due almost, to its complete abandon to disorder. A formal garden or a well kept park is a beautiful thing, but there is no middle ground between these and the forest. If nature is to be unstudied her recklessness must be complete. Among the various plants the most beautiful is the vine maple, the foliage is not thick and is very delicate, and in September the graceful sprays of this plant are displayed against the dark green forests in flaming colors of red and yellow and all intermediate tones, deeper and more striking than the Fall colors of New England.

The new Government road to the mountain winds among these immense fir trees. It is not generally known that photographs taken in the forest are better without the direct sunlight. A dull day or just after sunset is a good time and sky within the borders of the picture should be rigorously excluded. The essential thing is not the amount of light but the light contrasts over the picture as a whole. The contrast of splotches of sunlight or of sky, with the shadows of a forest is usually far too violent to render photographically, even though these elements may make the scene itself more beautiful.

I camped on both Mount Rainier and Mount Hood at an altitude just where the trees thin out and give place to the open alps below the snow. This is to say at about six thousand feet and at a good height for excursions either up or down. I have camped on many mountains, at many heights and in many parts of the world, so when

I say that these flowering alps of the northern Cascades in the month of August are more beautiful, in every way more delightful places to camp, to enjoy the beauties of nature and the stimulation of life out of doors—I speak calmly and without prejudice for I believe that I know the elements necessary for such things. Of the wild flowers of these slopes I feel competent to use only the old hackneyed expression—they bar description in their loveliness. Imagine a little bowl-shaped depression within a circle of those grotesque wind blown pines, carpeted with the richest green moss, with red rocks protruding here and there. Peppered on this green carpet are delicate little blue flowers with higher stalks between bearing gorgeous crimson heads—positively flaming crimson. But this can give little idea of it because there is nothing even like it that one who had not seen it can associate it with. It is another example of the strange twist that nature takes when she distributes her most delicately beautiful plants in her most rigorous climate. It is universally true that the farther north we go, even to the Arctic, and the higher up, even to the snow line,—the more prolific and lovely the wild flowers. And in the tropics wild flowers are conspicuously absent. When I left Rainier about the middle of September all of this summer beauty was under about a foot of fresh snow.

Can anything be chillier and more sodden than living under canvas in a snow storm? And this before the summer properly should have ended? A snow so continuous and heavy that much of one night was spent in scraping it from our tents to keep them from collapsing. But this sort of thing must be expected on Mount Rainier where the climber's month is limited to practically one of the twelve. I had made the summit climb of Shasta and of Hood, but Rainier was now out of the question for this season. There were however compensations in those rare rifts in the storm when the clouds rolled boiling up and distant vistas flashed out, if only momentarily, still, clothed in the new white garb and wonderfully strange.

Mist, haze, smoke and rain are all atmospheric effects that can be used to produce the effect of "depth" in landscape photographs. They draw a veil over distant objects without affecting the foreground, thus making the distance look distant. This is very evident in the picture of Mount Shasta, but in pictures of more moderate distance it is often difficult to find. Falling snow may furnish such

Photo by C. A. Gilchrist.

PLATE V. ON MOUNT RAINIER IN A SNOW STORM.

Photo by C. A. Gilchrist.

PLATE VI. BIG FIR TREES OF MOUNT RAINIER.

a veil for very short distances. I used it on Mount Rainier, where the absence of dark tones in the trees of my background was due to a veil of actual snow flakes, and these pictures besides having the requirements of "depth" suggest just such a snow storm because the trees themselves are laden with the soft white material, Time pictures taken while it is snowing are very different things from snow pictures taken when the fall has ceased. They are really mean things to take, especially when one is equipped for summer work only. As in all really studied pictures these usually require hours of hunting and waiting, and standing around in snow drifts is not soothing to the extremities. Lenses, plate holders and so on must be put somewhere while operating and they are likely to receive cold and wet treatment from both above and below in a heavy driving snow storm. One may arrange for assistants and other conveniences but these will be found of little avail for the movement of snow is not confined to the vertical direction. It is a case of just "bearing it." But enthusiasm ameliorates all hardships and the real technical difficulties are not these. I always was a poor hand at estimating exposures but I have a good eye for something more important and that is estimating the light contrasts, not the total light but light values. My snow pictures were grossly over exposed and over developed but the values were good and subsequent reduction of the negative by dissolving out much of the dense silver deposit that forms the image, gave good thin negatives of even better printing qualities than would have been possessed by so-called properly timed exposure. This, however, is a thing that never could be said of under exposure.

I am saying very little about picture taking above the snow line for the simple reason that a summit climb of such a mountain as Shasta or Rainier, leaves me quite without energy for picture study. But with Mount Hood it is different. Only a little over ten thousand feet and yet with all the features of a true "ice" mountain, Mount Hood is a most delightful mountain to climb or to browse about upon. Here, two or three good climbers provided with a rope and ice axes, may, in a comfortable short day's outing, investigate all the mysteries of the world of "living ice." Just to crawl around the edges of the gaping green crevasses, to whack out steps as big as buckets for the pure pleasure of swinging the axe, to go slowly and with care and safety among what might be so dangerous and terrible, with plenty of time and plenty of lunch,—is a pleasure as keen as the juvenile pleasure of boys climbing a tree. It is play pure and simple, and play for the adult. The great fascination of this upper world is its complete unlikeness to anything we are accustomed to below. It is like an imaginary world, it is worthy to be described mysteriously as in a fairy tale. Everything that affects the senses is different. There is no earth or vegetation, the glacier we stand upon may be as large as a township yet it is ceaslessly moving and changing, the view is always tremendous, shapes are strange and grotesque, it is very cold in the shade and intensely hot in the sun, the air is of a purity never known below, breathing becomes difficult yet exhilaration takes possession of one,—in short the affection of all the senses combine to make us feel that at last we have left the real world behind and entered an imaginary one we really touch.

SOME RESPONSES TO ENVIRONMENT IN MASSACHUSETTS.

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(Continued from the July Bulletin.)

The most marked attribute of Massachusetts' chief industry—manufacturing—is the degree to which various types are segregated or "localized"—to use the economic term. The textile industry, which is the greatest one in the state and in whose parts Massachusetts leads the nation, shows a marked tendency to cling to a few places. The cotton mills are for the most part in four localities, namely: on the southeast bays, the Merrimac and Connecticut rivers and the Blackstone; the wool mills are gathered together on the small streams of the eastern highland; the shoe factories cling to the Boston lowland and eastern plateau; and the writing paper plants are concentrated in the Connecticut Valley. A similar confinement to a narrow region is true of the jewelry, whip, horn-goods, chair, tanning and optical industries. We can not attribute this high degree of localization to physical causes entirely, for that is by no means true, yet the isolation caused by the trend of the valleys has been a very large factor contributing to the result. Most industries spread from one center by imitation, so it is quite natural that the communities within easy reach from the originating town should be the ones most likely to copy a successful enterprise, for the towns in the next valley, though near at hand geographically, are far away socially and industrially because the lines of communication are opposed to free interchange. We find, therefore, that the same industry is repeated in nearly every town in the same valley, even when that valley crosses two states, whereas the next valley, to the east or west, will be occupied by a different set of factories. As examples, the Quinnebaug and Thames Valley are full of woolen mills from Southbridge, Mass., to Norwich, Conn., but, on the other hand, the next large valley to the west, the Connecticut, is just as characteristically a paper center. To clinch the matter yet closer, we have but to point to the fact that the capitalists who founded Lowell created Lawrence also, both towns in the same Merrimac River Valley, but it was Hartford money that built Holyoke,[6] although Lawrence and Holyoke were started about the same time and for the same manufacturing industry, namely cotton. As a consequence, the localization of industry is more characteristic of Massachusetts than any other state, a condition which is not due to economic causes entirely, but is partly based on the separation of each little section of Massachusetts from all the other parts of the state.

Agriculture too, as well as manufacturing, shows the segregating effect exerted by the topography, for the type of farming conducted in any one particular place is largely determined by the market and this in turn is influenced by routes of travel. The best market in Massachusetts is found in the Boston basin with its teeming cities crowded close together, but this Mecca for food producers is shut off from most of Massachusetts so that even where soil and distance would permit the growth of truck crops they are not the rule, because it is too difficult to haul them to the point of consumption. It is only upon the Boston lowland, coastal plain and lower portion of the eastern plateau, all within the region devoid of great hills, that truck crops predominate. The Connecticut Valley is an exception to this rule, for gardens fill all the space not taken up by manufacturing cities and towns. Of course, all truck gardening must be conducted within a reasonable diistance of its market, but the area for Boston in hill-bound Massachusetts is about half that for Philadelphia from across level New Jersey.

The greatest agricultural activity in Massachusetts is dairying and it is remarkably distributed over the whole state, yet—the crowning point of all in reference to the influence of the trend of the valleys and hills upon agriculture—despite the overwhelming predominance of dairying among the farming activities of the state, the cities surrounding Boston have found it advantageous to draw milk from the Rhode Island and Connecticut farms to the south, and from Maine and even Canada to the north rather than from the highland sections within their own domains to the west; although these places outside the state have no special natural superiority. Knowledge of this condition makes Massachusetts dairymen very angry and they attribute it entirely to unfair railway rates, but they will have to remove the hills before the situation can be completely cured.

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[6] Both Hartford, Conn., and Holyoke, Mass., are in the Connecticut River Valley.

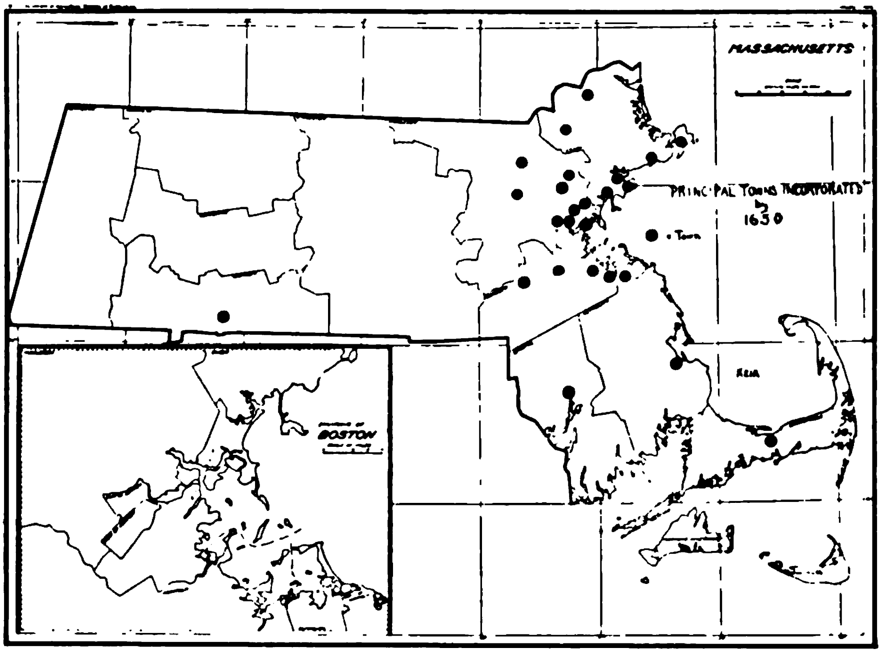

Fig. 5. Principal Towns Incorporated by 1650.

Similar to the segregating of manufactures and crops there is a differentiation in the type of summer visitors found in the various sections of Massachusetts. We are not accustomed to think of vacationers as forming an "industry," yet to all of New England the entertainment of people upon a holiday is of no mean importance, for it is estimated that fifteen to twenty million dollars is the annual "harvest" to these states from this occupation. In the Berkshires, in the central highlands and in the numerous shore resorts, Massachusetts takes a goodly toll from those who come to enjoy her natural advantages. The curious aspect of this summer traffic is that in no two parts of the state does one meet people from the same home cities, but each section has its own individual clientele. The well-to-do east-coast people spend the summer along the North Shore or go still further north into Maine and Canada, while the less wealthy people seek the beaches along the South Shore. Very few either of the rich or the poor travel westward in their own state. On the farms of the highlands the visitors come from the towns to the south in Connecticut, while the city people of the Connecticut Valley flock southward to the shore resorts along the border of the Long Island Sound. The Berkshire hills and valley are the seat of estates belonging to wealthy people from New York and a few from Connecticut. The double-track express train service to the Berkshires runs northward from New York and not westward from Boston.[7] In almost every case the summer population travels north or south. You may choose your social environment for the summer by a nice selection of physical environment, for the valley you elect will determine the people you meet.

By a little reflection over what has been stated, it is easy to perceive that the topography of Massachusetts greatly alters the currents of life within the state, although there are few insurmountable barriers. It has affected the earliest settlements and the present distribution of population, and furthermore caused a segregation in manufacturing projects, in agricultural activities and even in the persons attracted to the state upon pleasure bent. This feature of the physical environment therefore is worthy of attention.

A no less important phase of the natural surroundings in Massachusetts is the effect produced upon the lives and occupations of the people by the one-time visitation of the glacier, the most important and far-reaching event in the geological history of the state. By forming numerous water-power sites, made excellent by reservoir lakes, the glacier was directly responsible for the later growth of manufacturing in Massachusetts; by distorting the soil, the ice sheet set in motion those forces which have made agriculture in the state of so little importance; and by removing the overburden of rock the passage of the northern invader brought to light the underlying stores of granite, the chief rock resource of the present commonwealth; therefore, manufacturing, agriculture and quarrying, the three great industries of the present, have grown out of conditions produced in this one geological era of the past.

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[7] North Adams on the Boston and Maine and Pittsfield on the Boston and Albany are the only towns having *direct* connection with Boston, while every town in the Berkshire Valley is on the direct line to New York City.

Wherever the ancient rivers were obstructed by glacial material, they were forced to find new paths around the blocked passageway and in making the detour often flowed over uncut ledges; the power at falls thus created has been a source of wealth that is difficult to estimate because the hundreds of small places made available for manufacturing proved a boon to the earliest experimenters in factory enterprises and helped to establish manufacturing as the foremost industry of Massachusetts. All of the brooks and small streams of the state are full of falls and reach the large rivers through narrow canyons, both of which conditions favored their early development, for the reason that small streams were easier to control than large rivers and the canyons readily accommodated themselves to dams and reservoirs.

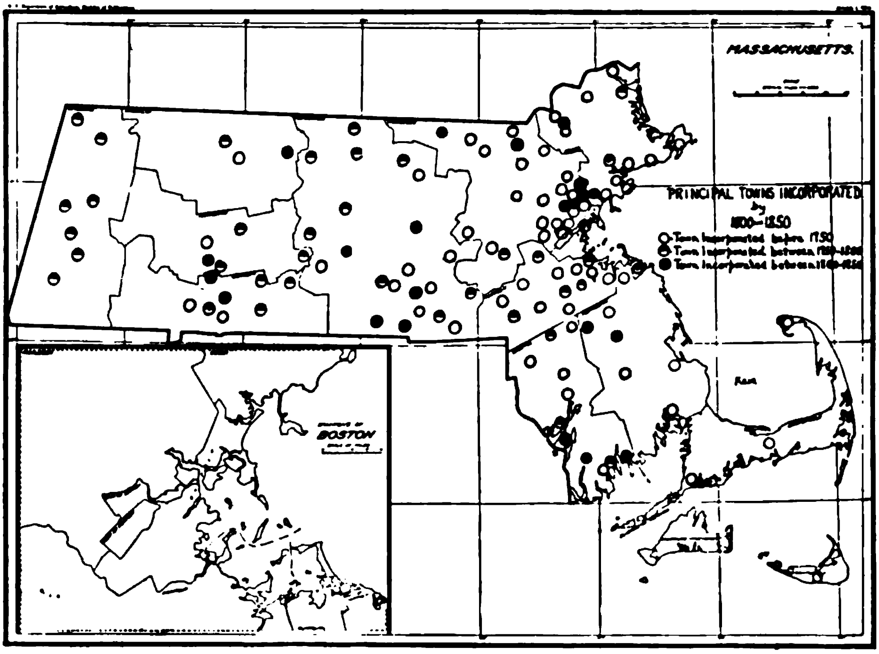
MASSACHUSETTS.
PRINCIPAL TOWNS INCORPORATED
by
1800–1850
○ Town Incorporated before 1750
Town Incorporated between 1750-1800
● Town Incorporated between 1800-1850
BOSTON

FIG. 6. PRINCIPAL TOWNS INCORPORATED BY 1800 AND 1850.

Waterfalls are useless for power purposes unless the stream flow is maintained with a high degree of uniformity throughout the year and here again the glacier aided the future commonwealth, for not only did the ice sheet produce falls but also made natural reservoirs wherein flood waters were stored and streams regulated during the dry season. After the main body of ice left the land, there remained in hollows and deep valleys blocks of ice which, slowly rotting, left depressions that formed lakes. In the course of time some of these lakes have been partially filled by vegetation and are now swamps. Both the lakes and swamps perform the same function of accommodating floods and holding back the water so as to bring about a more uniform flow in the stream. It is the ***combination*** of falls, and regularity in the volume of water, that makes a site valuable for power, and since the glacier endowed Massachusetts with both of these advantages, it enabled her to lead the way in the development of manufactures.

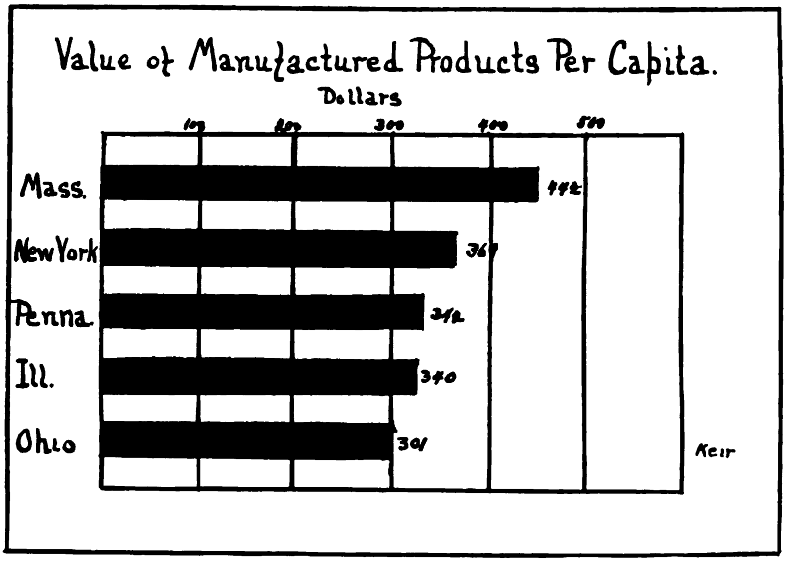

FIG. 7. VALUE OF MANUFACTURED PRODUCTS PER CAPITA.

Naturally the most falls were in the highlands and mountains of Massachusetts and when about 1750 water power commenced to be utilized for small mills, a deflection of population from the coastal plain and plateau took place, so that almost all of the present towns of importance in the inland territory began their history between 1750 and 1825. For the first time the domain remote from salt water assumed an importance in the eyes of the progressive young men in Massachusetts; a new resource was spread before their gaze. Mill after mill was set up, and towns consequently appeared where previously lonely farmers had led sequestered lives. The "Father of the Cotton Industry," Samuel Slater, whose first factory was at Pawtucket, R. I. (1790), followed the Blackstone River back into Massachusetts and established a new project in that part of Oxford that is now Webster. The whole Blackstone Valley from Worcester to Providence became virtually one continuous mill village, and similarly the Quinnebaug River from its diminutive sources above Southbridge southward to Norwich, Connecticut, clattered with the activity of wool mills. The Chicopee, the Westfield, and especially the small branches of all the streams named, took on an importance that hitherto had been utterly foreign to them. In this manner and for the purpose of developing the water resources, inland Massachusetts was settled and transformed to a region of potential consequence. To the citizen of 1812 who saw commerce paralyzed, and the promise of a rapid rise in the importance of manufacturing, it must have seemed that the long neglected interior of the state would soon threaten the sovereignty of the shore zone, for the man of that time could not have foretold the limitations that progress in machines would place upon the water power of the state; he could not have predicted that looms and spinning frames would grow so large and heavy that the power of many of the small streams would be inadequate. The era of water power helped to distribute the population over a wider area and bring into usefulness a great proportion of the territory of the state, and in its heyday the textile industry became largely fixed as an inland business. If the invention of textile machinery had come *after* the successful application of steam engines to factory needs instead of *before* it, central Massachusetts would never have been much more than a summer resort. How true this statement is may be gauged by the shoe industry in which the industrial revolution did not take place until after 1850, with the result that it has always hugged the shore. If this business had been put upon a machine basis at the time when cotton was wrested from hand labor, it inevitably would have been moved inland[8] upon power sites, and the momentum of an early start would have kept it there. Fall River and New Bedford, located upon the coast and using coal for power, illustrate what would have happened to the majority of cotton mills if they had succeeded rather than preceded the steam engine. We must attribute the expansion of inland Massachusetts to its resource of glacially derived water power and consider it fortunate that its factories became firmly rooted before coal was used for power purposes.

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[8] There is a tendency on foot at present for shoe factories to move inland to textile centers, but this is due to the exactions of labor upon the coast and the effort of manufacturers to escape to a town where their shops will be

The earliest attempts at manufacturing were upon an exceedingly simple scale, hence unbelievably tiny streams could be utilized for power. For example, the story is told that at Southbridge upon a branch of the Quinnebaug River, the manufacturer whose little shop has grown into the great American Optical Company was accustomed to employ a horse to furnish power when the brook ran dry in summer; and at one time a lusty negro was hired at ten cents an hour to turn the wheels. Power requirements so small as this did not necessitate large streams; therefore, wherever a brook flowed there a shop might be found, and the glacier had left the state a legacy of innumerable such waterways. Fire, flood and failure wiped out many of the experiments in manufacturing and only a gaunt, naked water wheel on a broken raceway marks the scene of former activity; but not all the early attempts came to an end so evil, for many of the first little shops have grown into great plants, such as the American Optical Company just mentioned. The chief importance of the numerous little falls is that they encouraged so many men to try their fortunes in factory enterprises out of which the fittest have survived and placed Massachusetts at the head of American manufacturing states.

The age of small-scale operation did not last long, especially in Massachusetts' greatest industry, cotton cloth production, because improvements in machinery were made so rapidly and spinning frames and looms became so much larger and heavier that the small water powers were utterly inadequate to drive the belts and turn the shafts; hence cotton manufacturing concentrated upon the large rivers. A case in point is furnished by the Boston Manufacturing Company, whose first mill at Waltham, built in 1813, was the earliest

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the most prized work places because their wages are higher than in a cotton or woolen mill.

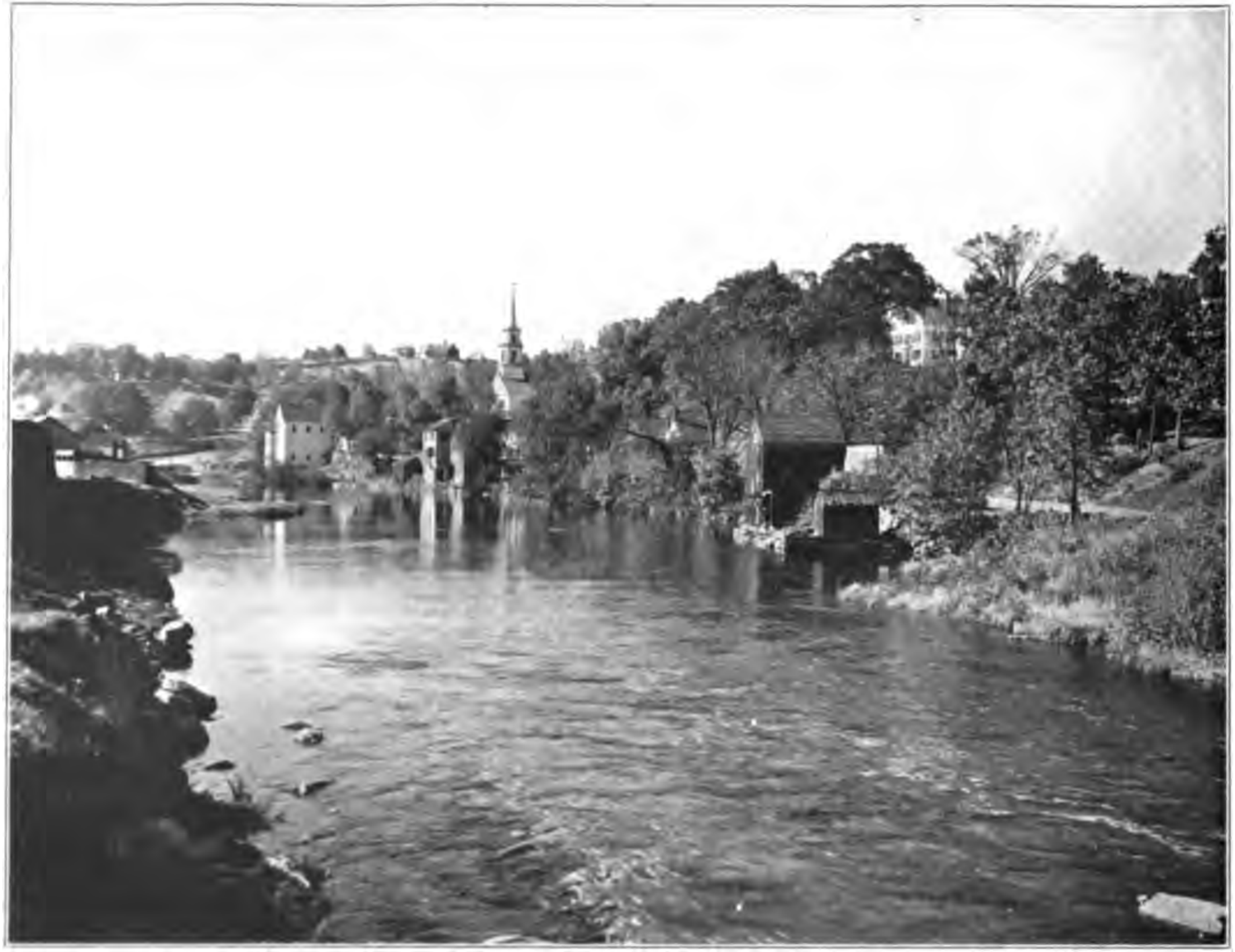

Plate VI. Miller's River at Royalston, Mass. A typical Massachusetts village scene. Note the farm houses on the hills.
Courtesy of Boston and Maine Railroad.

Plate VII. Miller's River at Royalston, Mass. One of the many small power sites in Central Massachusetts. Courtesy of Boston and Maine Railroad.

Plate VIII. The "Million Dollar Dam" at Holyoke, on the Connecticut River. Courtesy Holyoke Water Power Co.

complete cotton factory in America, but which by 1825 was incapable of expanding to fit the enlarged requirements of the business because the stream was too small. The company bought a site on the Merrimac, at a point where it drops thirty-two feet, and brings to the use of man 30,000 horsepower, so that next to Holyoke it is the most valuable power in New England; there (in 1826) out of the woods the town of Lowell was brought to life. By 1850 Lowell had a population of 33,000 and was exceeded in size only by Boston.[9] Along the banks of its power canals there were thirty-three mills, but since there seemed to be no possibility of additional expansion, the group of men in control went further down the Merrimac and selected the location[10] for a new village where Lawrence now stands. That city at present contains the largest woolen mills in the world.

At about the same time as the inception of Lawrence, plans were matured to erect on the Connecticut River within the confines of present-day Holyoke, a city which would be a second Lowell. In furtherance of this object a dam was built across the state's greatest river and when completed the Lyman Mills were established on the power site thus brought into use. Therefore, as the cotton industry grew, the wealth of small power sites was neglected and the few of the first magnitude developed, but large as well as small powers were a heritage of the glacier.

A similar advance from small streams to a great river is shown by the paper industry of the state. In the Berkshire Valley, where some of the first attempts to manufacture paper had been made, mills became a most familiar sight, for between 1800 and 1850 twenty-seven paper-producing plants were built there. The town of Lee seemed in a fair way toward becoming a paper center of great importance, for there were no less than eighteen mills within its boundaries. However a change in paper manufacture took place which robbed Lee of most of its glory. The mills of which those at Lee were a type used but small amounts of power to reduce rags to a pulp. Frequently the Lee papermakers formed the sheets by hand, for even the small crude, easily operated machines often were

[9] To-day Worcester is the second largest city of the state.

[10] Develops 11,900 horsepower at 26-foot fall.

not installed for this second division[11] of papermaking. A revolution was started when Foudrinier (1803) invented a machine that turned out a large amount of paper continuously, for this machine necessitated a great deal of power to keep it running. The machine alone took up as much room as a whole mill did previous to its invention. Furthermore, the machine called for a much enhanced amount of pulp, so that the pulp grinders were necessarily increased in capacity and consequently demanded more power to operate. The Foudrinier machine therefore paved the way for large-scale production, and made cheap power a crucial factor. The greatest water power in the state was established when the Holyoke dam was constructed, so the largest paper mills were built along the canals that cross the city, and it became the greatest writing-paper center in the country. There are a few famous mills in the Berkshire Valley—, for example, the Z. and W. M. Crane, Old Berkshire Mills, the Pioneer Mills and the Government Mills, in which latter our paper for money is produced—, but despite these noted exceptions the supremacy in high-grade papermaking rests with Holyoke and is founded on cheap power. Glacial action turned the Connecticut River from its true course at that point and in endeavoring to get back to its former path the river has cut across intervening ledges and falls seventy feet in two miles. The volume of the river is so great that this fall created 40,000 horsepower, a figure unsurpassed in New England. The influence of abundant cheap power changed the headship of the paper industry from ancient Lee to upstart Holyoke.

The paper industry, as well as the cotton, shows that first the small then the large powers enabled manufacturing to get a firm hold upon Massachusetts, and inasmuch as manufacturing is the greatest wealth-producer in the state and the products have made the state famous throughout the nation, the glacier has had no small share in shaping the destinies of the commonwealth and influencing the lives of the people.

To the glacier also must be credited Massachusetts' poor showing in agriculture, for the ice mixed transported boulders, gravel and sand so thoroughly with the soils formed in place that there is hardly a farm where the nature of the ground to be worked is uniform. During the era of agricultural self-sufficiency the variegated types of soil were not a detriment, for they permitted one farm to produce the many things needed by the isolated households; but in modern times with farming specialized by competitive money crops, the man whose holdings of land are not fairly uniform cannot hope to be successful in large-scale production. Inasmuch as American agriculture since the opening of the Erie Canal has been distinguished by its extensive rather than its intensive character it may be seen how handicapped the farmers of Massachusetts have been by the marked inequality of the soils with which they labored.

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[11] Paper manufacture has three divisions: (1) Reduction of raw material to pulp; (2) sheets, single or continuous, formed from pulp; (3) finishing.

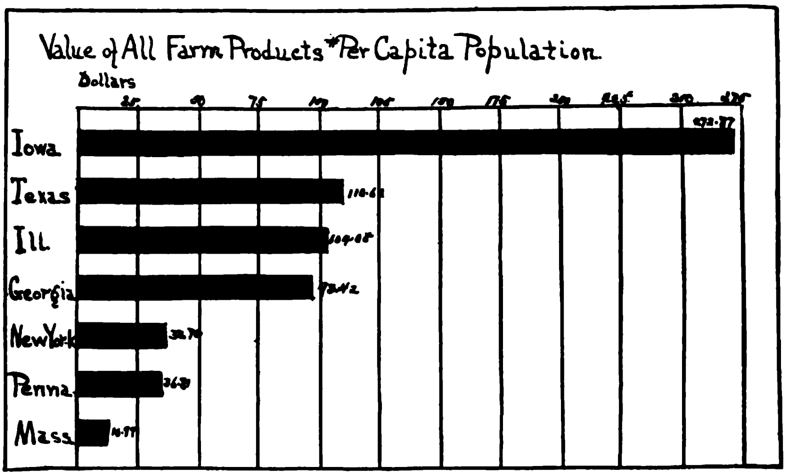

FIG. 8. THE INSIGNIFICANCE OF AGRICULTURE IN MASSACHUSETTS.

The multiplicity of soil types on one farm aggravates another peculiarity of glacial drift, namely its lack of immediate fertility. Soils of this character will endure for an indefinite period, because the rock breaks up and sets free the chemicals needed for fertilizing elements, but compared to virgin prairie they seem lean and miserly. Since the farmers, like other business men, are less concerned with the condition that will confront their grandsons than they are with getting the greatest return for their own labor, glacial soils cannot compete with the prairies; hence when they are brought into rivalry, the soils that will last the longest are abandoned in favor of those which give wealth the quickest. There is no large area of Massachusetts free from glacial drift, therefore, her agriculture sank to a comparatively low level when forced to contest with the deep, extensive, rich soils of western states. Only seven per cent. of the people dwell in rural surroundings and crops valued at $10.99 per capita[12] are insignificant sources of wealth compared to manufactures that are worth $442 per person. Of the five greatest manufacturing states, Massachusetts devotes the smallest share of her energies toward farming.

Not only have the niggardly soils been forced to compete with more generous ones elsewhere, but right at home they have had to meet rivals more potent—the factories—which, as we have shown, were set up in nearly every stream valley at places where the glacier had forced the waterway into new channels. The ice sheet, therefore, made manufacturing easy, but heightened the ordinary difficulties of farming. The close propinquity of easy work in mills with unremitting labor on the farm spelled doom to the farm. If all the manufacturing plants in the state had been way off "down east" farm lads would have dreamed about them, but their lure would have been lessened by distance; as it was, the boy heard the factory whistle in the nearby valley when he ploughed.[13] Since the glacier was responsible for placing the factory within sight of the farm, and at the same time made farming an arduous, profitless task, we may safely attribute to its visitation the relative positions of the two industries, with manufacturing far in the lead and agriculture trailing ignobly in the rear.

Dairying, the one great agricultural activity common to all parts of the state, is the direct outcome of the two factors outlined above. Soil poorly adapted to extensive farming; and populous centers growing in the valleys at points where glacial drift caused a change of current, creating water power and consequently manufacturing; these are the two principal forces that have placed cow culture in the forefront of Massachusetts agriculture.

With few exceptions all the soils surveyed in the state have proved more admirably suited to grass than any other product, so it is only the expected result that hay is the greatest crop, for even precipitous fields, too steep to permit any cultivation, may be devoted to grass and utilized as permanent pastures. Consequently the most familiar sights in Massachusetts are bursting hay wagons or rocky hillsides dotted with grazing milch cattle. In a region of such miserly soil as this, dairying is the logical industry, because it exerts the least drain upon the land. Crops which require a large amount of plant food would soon bankrupt the ground, but dairying raises the quality of the soil because so much fertilizing matter is returned to the meadows and pastures; therefore milk production is the industry most consistent with the environment of Massachusetts, provided a market can be found.

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[12] Per capita means whole population, not per capita rural population.

[13] See illustration, Plate VI, page 174.

It is upon this latter score that the glacial water-power sites have supplemented glacial soils in bringing about the preëminence of dairying, for nowhere else in our country is there a state where so great a proportion of the people is separated from the land and creates such a demand for milk and butter. Ninety-three per cent. of the population lives in towns larger than twenty-five hundred, and seventy-five per cent. in cities of more than ten thousand population. Since this unparalleled market increases in size yearly, and inasmuch as cows may be raised wherever grass will grow, and considering that grass is the crop best adjusted to the soil of Massachusetts, the prevalence of dairying in the state is easily interpreted.

Notwithstanding the fact that the glacial period was so unkind to Massachusetts agriculture in most respects, it did confer benefits, however, upon the farming of certain particular parts of the state, notably the Connecticut Valley and Cape Cod.

The great gash cut across the state by the Connecticut River is the richest agricultural region in Massachusetts and the most unique, for the falling waters of the glacial lake formed by a natural dam below Hartford left terraces along the valley that mark the various levels at which the lake paused in its retreat. These terraces are composed of silt gathered from the whole Connecticut watershed and carried by the stream to the lake where the check offered to the current caused the water to drop the finest particles at the borders of the lake, and the coarsest nearest the channel. The resultant soil is the best that can be found in the state, and the easiest to work. The variation, however, between the terraces and the borders of the present river gives rise to a segregation of crops.

Along the terraces tobacco has been the leading crop since 1802 when the wife of a Windsor farmer made the first cigar to be produced in the Connecticut Valley. Tobacco is most exhausting to the land, therefore only the rich, deep level soil of the terraces is devoted to the crop. On the meadow lands bordering the river the leaf is too dark, heavy and low grade, so that the very suspicion that tobacco came from the meadows is enough to kill its sale, but the land so despised for tobacco is prized for corn, potatoes, onions, other vegetables and grass. The valley has almost half of the state's total acreage devoted to corn, about a third of that used for potatoes, and the number and quality of onions raised in the valley make it one of the minor centers for that product in the United States.[14] This is the only portion of Massachusetts or all New England which compares favorably with the rich agricultural areas of New York, Pennsylvania or the prairie states.

Next to the Connecticut Valley the chief exception to the rule that poor soil makes dairying supreme is found on Cape Cod and the adjacent portions of the mainland. The Cape is a moraine, the dumping ground of the glacier, and its soil is sandy, which causes it to be well adapted to berries or small fruits. Hence it is the home of the cranberry, the principal small fruit raised in Massachusetts. To grow cranberries there are three physical requisites; plenty of sand, a bog and water. The Cape possesses all three of these in abundance, so it was the first part of the United States to become famous for cranberries, and even at the present time produces one half the entire crop for the nation.

We must frankly state, however, that the climate of Cape Cod is fully as influential a factor in its agriculture as the soil, for the cool, even temperatures give the cranberry crop a freedom from fungous

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[14] New York is the only eastern state that surpasses Massachusetts in onion acreage.

	Acres 1909.
Ohio	6,000
New York	5,000
Texas	5,000
California	4,000
Indiana	4,000
Illinois	3,000
Louisiana	2,000
Massachusetts	2,000

diseases that is not attained in any of the other cranberry districts.[15] Furthermore, the climate has given rise to a thriving market-garden business because the spring seasons on the Cape are fully two weeks ahead of the mainland, so that the farmers have the double advantage of a climate as soft as Maryland, yet right next door to the greatest consuming market in New England. Cape strawberries appear in Boston the first week in June, and being the foremost native berries to arrive, sell for 25 to 50 cents a quart. Ten to fourteen days later the avalanche of native berries strikes the market and depresses the price to 7 cents a quart. Climate, therefore, is a large determinant of agriculture on the Cape and of course it is due to the almost all-surrounding ocean. The glacier, by dumping its burden of materials in the sea, gave the marine climate an opportunity to operate for the benefit of man, and the ice sheet also provided the sort of soil most needed for the full utilization of climate in producing early season crops.

It is worthy of note that the soil of Massachusetts is the basis of a social movement that may have consequences of grave significance. Everyone is familiar with the story of farm desertion that took place when the prairie states were opened to settlement, and also the abandonment of the land that has kept step with the growth of factories, until, as we have shown, Massachusetts is a state of cities and its people almost wholly a great group of mill operatives. If we may look for an increase in the amount of capital necessary to conduct factory enterprises on account of the ever-present tendency to transfer skill to machines, then the future of Massachusetts is dark indeed, for its population will sink lower and lower as mere tenders of machinery, provided there is no escape from this thraldom. The mechanical equipment of mills has already reached such a point of perfection that inexperienced immigrants may operate the controlling levers. The social result is that Massachusetts is inhabited by persons two thirds of whom have lived in the United States less than two generations[16] and almost one third are actually foreign

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[15] New Jersey, Michigan, Oregon, Washington, and Long Island.

[16]

Native whites of native parents	32.8
Native whites of foreign or mixed	34.8
Foreign born whites	31.2
Negroes	1.2

Arranged from abstract U. S. Census, 1910.

born. If Massachusetts is to perform the traditional function of the melting pot these people must have the same choice of occupations offered by cheap land that enabled our forefathers to make a place for themselves in the world. Most fortunately the glacial soil of Massachusetts will permit the aliens within her boundaries to emancipate themselves from the serfdom of factory labor, and moreover Massachusetts is a far more advantageous place for an immigrant-operative-farmer to commence his struggle for economic freedom than states such as Illinois, where the soil is much richer. The Illinois factory worker is bound to his mill toil, while the Massachusetts laborer may break the shackles if he so chooses. This statement is too startling to go unproven, but the evidence is at hand, and shown by the subjoined table:

	Mass.	Illinois	U. S.
Size of farm: Area, number of acres	77.9	129.1	138
Value per acre	$36	$95	$32
Average value land per farm	$2,859	$12,270	$4,476
Per cent. operated by owners	86	56	68.1
Per cent. operated by tenants	7	41	25.9
Per cent. operated by managers	7	3	6.1
Population per square mile	418.8	100.6	30.8
Per cent. population rural	7.2	38.3	53.7
Increase rural population between 1900–1910.	2.2	0.3	11
Number cities 25,000 or over	25	12	
Number towns 2,500 or over	154	144	

Compiled from U. S. Census, 1910.

The Illinois farm is sixty-six and two thirds per cent. greater in area than the one in Massachusetts, its average value of land per farm is more than four times as great, and almost half of the farms are operated by tenants; here we have a statistical picture of a landed aristocracy. Anyone who visits Illinois will see farms worth $300 an acre, upon which tenants are struggling for existence, while the county towns are filled with the landowners living on rents. How can an immigrant working in a Chicago factory aspire to take up land and make his way upward in the world in the face of these hopeless conditions? Yet Illinois ranks third among the states in the value of products manufactured; fourth, in value of manufactured products per capita; and fifth, in the proportion of total population engaged in manufactures.

It would appear as if the people of future Illinois will fall into two classes, one the owners of land and machines, the other the workers. Under the conditions cited it would do a mill employee little good to seek the country, for he would but exchange masters. Circumstances are adjusted in Illinois to make real the nightmare of the rich growing richer and the poor growing poorer.

On the other hand, the Massachusetts farm is small, the land is cheap and tenantry is well-nigh unknown; moreover, the state offers unexampled opportunities in the matter of markets, as a glance at the figures of population and the numbers of cities will show. It is encouraging to see in every center of manufacturing in Massachusetts a slow seepage of factory workers back to the land. Immigrants working part time in the shops and part time on their farms pay for the farm—which frequently costs them as little as twenty-five dollars an acre—until the debt is removed, and then retire from the mill permanently and take their places as owners and workers of the ground. The soil despised by the previous generations of Americans may be the salvation of the next, and be a mighty influence in the amalgamation of conflicting races. The very poverty as compared with prairie soils has kept the land within the reach of the pocketbooks of poor men, and may be the means of regeneration of both the immigrants who live upon it, and the state within which it lies. The soil is by no means sterile or worked out, and when used for fruit, berries and vegetables yields a fair living, because the great market will absorb all that is produced. In the end, therefore, the curse put upon the agriculture of the state by the glacier may be lifted. The contrast, however, between the opportunity offered a poor man in Illinois and one in Massachusetts, now curiously reflecting credit to the state with the less natural endowments, is the result of conditions set up by man. As long as society permits landlordism and allows those that have to hold, in defiance of public good, then a situation like the one sketched above is possible, but if America is to follow English precedent it seems probable that before the mass of workmen are forced to accept land like much of that in Massachusetts, a change will take place in our laws and landlordism be taxed out of existence.

We have pointed out that the glacier was responsible for the early development of manufacturing in Massachusetts, because the changes instituted by the ice sheet bequeathed to the state so many valuable power sites, and we have also shown that the poverty-stricken condition of agriculture is due to the same set of circumstances added to the disturbance of the soil. Moreover, the exceptional parts of the state where agriculture is advantageously equipped by nature owe their prominence in farming to the alterations wrought by the glacier. Manufacturing and agriculture are two industries whose present destinies were foreshadowed in the past geological era, and to them we may add the quarry industry of the state, for it uses a stone laid bare by the action of ice upon the surface of the ground.

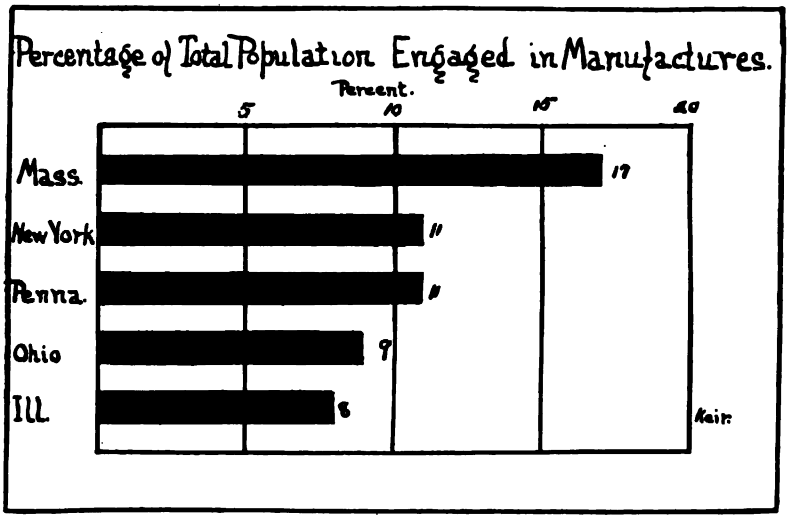

FIG. 9. PERCENTAGE OF TOTAL POPULATION ENGAGED IN MANUFACTURES.

Until the time of the glacier, granite lay buried deep beneath the surface of the earth, but the crushing burden of ice so levelled many of the hills that the interior granite lay exposed to the air when the glacier had passed away. Man has taken advantage of this circumstance to quarry the stone for uses ranging all the way from paving stones worth 25 cents a cubic foot to beautiful monuments which cost $70 a cubic foot. Granite has so much utility for structural and ornamental purposes that it is the most valuable stone resource Massachusetts possesses, comprising 63 per cent. in value of all the stones quarried. This stone would not be available if the glacier had not removed the overburden under which the granite was hidden.

All told, the glacier changed the land in ways that were beneficial to Massachusetts, for its water power was a boon to manufacturers, the silt in its lakes and the coarser materials at the terminal moraine have been an advantage to farmers, and rock resources have been placed at the disposal of modern quarrymen. On the other hand, the glacier has seriously limited agriculture, because it scattered debris over so much of the state, yet in the course of time even this apparent detriment may prove a boon because it has kept the land cheap and brings it within the means of poor people, who can use it to attain their economic independence.

The main features of life in Massachuetts have been controlled by two environmental facors, the first of which—the general north-south trend of the hills and valleys—was responsible for the early grouping of population along the seaboard and the Connecticut valley, and operates the same way today; the direction of land forms also caused the main lines of travel to run north and south instead of east and west, a route more desirable for political reasons. Manufacturing, agriculture and even summer visitors have been segregated by the tendency of the hills and valleys to open northward and southward. Along with this feature of the environment and fully as influential, are the changes brought about by the visitation of the glacier. The creation of water power, the alteration of the soil and the baring of rocks have done much to direct industry; for manufacturing, agriculture and quarrying in their present form, and in their positions of relative importance may be traced to these causes. Since the history, politics, the prestige and the present problems of the state have all turned about one or the other of these two environmental factors or the results that have flowed from them, we may safely grant them a place of paramount importance.

NOTE: For the plates used throughout this article the author is indebted to the Boston and Maine Railroad.

BOOK NOTES AND REVIEWS

Bartholomew, J. G. *The Advanced Atlas of Physical and Political Geography.* 96 plates. Oxford, The University Press. 1917. Price $3.75.

This series of maps, designed especially for schools and colleges, meets a long felt need, not only for advanced students, but for all who need an inexpensive, but exceedingly reliable and serviceable atlas. It is incomparably the best small atlas published in English. The physical maps of the continents and countries are done in shades of brown and green by the Edinburgh Geographical Institute and are of the high standard for which maps from this source have justly obtained a high reputation for accuracy of subject matter and excellency of execution. The size of the pages, 8 in. by 13 in., gives, for all the maps and especially for the double-page maps of which there are many, ample size. The physical maps all contain political boundaries, overprinted in red, and sufficient place names to make them serviceable, but not overcrowded. In addition to the physical maps there are political maps of the continents and of several countries, and maps showing rainfall, temperature, population density, ethnography, geology, etc. At the end of the atlas is a general index of 31 pages. The convenient size, the fine execution, the wise selection of material, the small price, all combine to make this atlas an almost indispensable one for advanced students and for all interested in geographical matters. One is tempted to use nothing but superlatives in describing it, overlooking minor points that might be criticized, because of the excellence of the whole.

Dominian, Leon. *The Frontiers of Language and Nationality in Europe.* Pp. 356, colored maps. Illustrated. Published for the American Geographical Society of New York by Henry Holt and Co. 1917.

This excellent volume is a timely study in applied geography. At this time, when everyone is thinking seriously of the causes of the war and of the problems of peace, a careful presentation of the facts in regard to the linguistic borderlands of Europe not only fills a real need, but may well prove to be a strong influence in procuring a saner peace. The adjustment of European boundaries based on a recognition of the language factor is not only desirable, but necessary, if a more permanent peace is to be secured. For, as Mr. Dominian well says, "The European War is no exception to the fact that almost every conflict of magnitude has been due, in part, to ill-adjusted boundary lines" (p. 328).

The work contains chapters on the French and German linguistic borderland; on the Italian language frontier; on the Scandinavian and Baltic; on the areas of Polish, Bohemian, Moravian and Slovak speech; on the Balkan peninsula with its race and language problems; on peoples and geography of Turkey, and a concluding chapter on "Summary and Application." There are besides five appendices, among which the Selected Bibliography and the Key to Place Names are most worth while.

Fine colored maps from plates and numerous sketch maps illustrate the text admirably, though more attention might well have been given to physical geography. The linguistic element of the maps, on the other hand, is developed to a degree that reveals an extraordinary amount of painstaking care and effort. In themselves alone, some of these maps constitute a real contribution to the study of the subject. On the preponderance of this or that language in the disputed areas there has been so much vague generalizing that a presentation of accurate data is most acceptable. For example, the proportion of French and German in each community in Alsace-Lorraine is indicated by a system of marks, definitely showing the percentage of the population in towns and villages that speak French or German. Similarly, those who have been unable to get satisfactory information on the race and language situation of the two duchies wrested from Denmark in 1864 should consult the sketch maps on Schleswig-Holstein. In view of this general excellence of the maps, the lack of uniformity in the language of the place names is, at times, peculiar. Thus in the map on the Italian Borderland (p. 65), French and Italian are strangely intermingled, as, for example, *Savoie*, Dep. Alpes Maritimes, Doire Ripaire R., Geneva, Gulf of Genoa, Alexandria, etc. Nor is there any apparent reason for "Bozen" in the map and "Botzen" in the text on p. 326.

Space is not available for an analysis of the different chapters. Those on the Balkans and the Turkish situation seem to the present writer among the best of the book, though he cannot share the author's optimism in regard to the prospective solution of the problems of that region. While it is true that "an ill-adjusted boundary is a hatching-oven for war, and a scientific boundary prepares the way for permanent good-will between peoples," it is also true that no geographer has yet been able to find these for the Balkans.

To the reader who has been accustomed to look for racial differences in the determination of political boundaries, Mr. Dominian gives scant comfort, for he believes that it is language rather than race that furnishes the test of nationality. On the other hand, he agrees in the main with the thesis that geographical and linguistic frontiers can be harmonized to form the basis for durable political or national boundaries. In view of the passions aroused by the war, the author has maintained an impartiality, commendable in a scholarly work. On the other hand, even from the standpoint of human migrations, few readers will accept the statement on p. 330 that "at the bottom of it all the fight (European war) is between Slav and Teuton." And in regard to German history, it is more in accord with the facts to see the "morning of modern German nationality" not "in 1815" (p. 316), but in the year of the war of liberation or even earlier. But these are lapses in a work of great merit, both as to its matter and presentation. The style is clear and direct. There is a good index and the bookmaking is excellent.

William E. Lingelbach.

University of Pennsylvania.

Elliott, L. E. *Brazil. To-day and To-morrow.* Pp. 327, illustrations, map. New York, The Macmillan Company. 1917. $2.25 net.

An attractively bound, finely illustrated and glowing account of the great Republic of Brazil is this volume by the editor of the *Pan-American Magazine.* Miss Elliott writes with enthusiasm and charm, producing a book well worth reading by the North American who often knows so little of this mighty nation to the south. The book covers a wide range of topics, beginning with a brief geographical interpretation and a résumé of the history of Brazil, and ending with Brazil's exterior commerce. In between is discussed colonization, social conditions, transportation, industries and finance. Covering so many topics on so enormous a country, much is inevitably sketchy and incomplete, but nevertheless the general summary is excellent. The chief criticism that may be brought against the book is its tendency to over-praise. Miss Elliott is very evidently fond of Brazil and the Brazilians—a good qualification for writing about the country—but one feels that many things that, if written, might not please the Brazilian have been omitted or faults and shortcomings have been glossed over. With all its great future and the many fine things that can be said about the land and the people, there are other things that a full and true account should not neglect. Nevertheless, it is probably true that we get a more accurate account of a people from a sympathetic friend than from a cynical critic, who cannot enter into the life of the people about whom he writes. This book gives us the picture of the country as seen by an admiring friend.

Latourette, Kenneth Scott. *The Development of China.* Boston and New York, Houghton Mifflin Company. 1917. Price $1.75.

"A sketch which . . . will give the essential facts of Chinese history, an understanding of the larger features of China's development, and the historical setting of its present-day problems; a sketch which does not burden the student with unnecessary details of unfamiliar names and dates, and which gives him the main movements that have led to the China of to-day."

This was the author's aim. That the aim was attained is borne out by reading the highly interesting and informing book, which is far ahead of most books of the sort. The way in which it is perhaps most effective is in emphasizing the larger features of China's development. For this reason it is especially valuable to students of the geography of China in that it discusses the broad outlines rather than the minute details of the history of the country.

The first chapter of the book, entitled "Geographic Background of Chinese History," is interesting to a geographer because it shows what an historian thinks are the significant geographic conditions influencing China's development. This chapter, though brief, is good. There are a few points which need revision. For instance, on page 5 the statement is made that "great fields of petroleum are known to exist" in China. Also, that "in one province alone a German geologist [Richthofen, Shansi Province?] has estimated that there is enough [coal] to last the entire world at the present rate of consumption for many centuries." Especially noticeable to a geographer is the lack of emphasis on the differences in the physical environment in north and south China, particularly differences in climate, and the inevitable results thereof. The statement in a later chapter on pages 78 and 79 that the mountain passes between China and Burma "are low and invite intercourse" is not correct.

The preceding criticisms, however, are of a minor sort. The book as a whole is excellent and can be recommended heartily to geographers as giving a clear and an accurate account of the development of the country which for centuries was the greatest in the Far East and which many persons believe will again come to leadership. The concluding chapter is a concise but illuminating statement of present-day problems in China.

WELLINGTON D. JONES.

UNIVERSITY OF CHICAGO.

Whiting, Lilian. *Canada—The Spellbinder.* Pp. 318, maps and colored illustrations. New York, E. P. Dutton & Co. 1917.

This book is a series of impressionistic sketches in which the author endeavors to set forth the mystery, charm, vastness, and grandeur of Canada. The writer suggests some of the creative personalities that have helped shape the career of our northern neighbor, and then paints the picturesque Maritime Provinces, hints at the mystery of Quebec and Montreal, indicates the stateliness of Ottawa, alludes to the domestic home-owning virtue of Toronto and touches upon the civic sturdiness of Winnipeg and Edmonton. When the eastern and central cities have thus been characterized by inference, the author spreads before the reader the panorama of the romantic charm, richness of resource, and prodigious extent of the territory that passes before the eyes of a traveller on the Grand Trunk Pacific between Edmonton and Prince Rupert. The Pacific Coast is also depicted so adjectively that even a Pacific Coast citizen would feel that justice had been done.

The book contains much of poetry, but little of geography. One suspects that it was inspired by the Grand Trunk Railway, for the book leaves the reader with a longing to visit the scenes portrayed.

MALCOLM KEIR.

Miller, Warren H. *The Boys' Book of Canoeing and Sailing.* Pp. 351, illustrated. *The Boys' Book of Hunting and Fishing.* Pp. 291, illustrated. New York, George H. Doran Co. 1916. Each $1.25 net.

These two books are by a well-known man of the outdoors, the editor of *Field and Stream.* Mr. Miller has all his life been an experimenter and discoverer in regard to those sports which take one close to nature and in these volumes he gives the result of many years of experience and study along such lines. The books are intended primarily for boys, but every person whose journeys require him to live for a time under the sun and the stars will get from them useful information. To the majority of campers-out the second volume will prove the more valuable, as its last third is filled with excellent suggestions about camp-craft, but both books are eminently readable and full of profitable information.

W. L.

Smith, O. W. *Trout Lore.* Pp. 202, illustrated. New York, Frederick A. Stokes Company. 1917. $2.00 net.

Mr. Smith is angling editor of *Outdoor Life,* and the illustrations in this book are all from his camera. Trout fishing is discussed from every point of view by the experienced author, who rounds out the story by telling how to cook trout and what kind of clothing to wear. In short, everything the angler needs to know about trout and their catching is given a place.

W. L.

Brigham, Albert Perry, and McFarlane, Chas. T. *Essentials of Geography.* First Book, pp. 264; Second Book, pp. 426. New York, American Book Co.

These books are a valuable addition to the list of geography textbooks for grammar schools. The elements that make up a successful text are here well blended. The style is clear and vivid; the illustrations are chosen with exceptional care and thought; the maps are clear and accurate; thought-provoking questions, suggestions and useful references are provided. Topics are selected with good judgment and appropriately introduced. The human side of geography is emphasized, but the physical is not neglected. Causal treatment is properly shown; man's relations to his environment are well presented. These qualities place the books in the front rank of geography texts and cannot fail to give them the recognition they deserve.

ERNA GRASSMUCK.

PHILADELPHIA NORMAL SCHOOL.

Verrill, A. Hyatt. *The Book of Camping.* Pp. 195. New York, Alfred A. Knopf. 1917. $1.00 net.

This little book, of handy pocket size, is both practical and comprehensive. There is a careful avoidance of unnecessary verbiage. While the adult who has camped out a number of times may wish a more detailed discussion of the various points covered, the volume cannot fail to be of the utmost value to the new camper or to Boy Scouts.

W. L.

GEOGRAPHIC NEWS AND NOTES

The Use of Topographic Maps.—Too many people in our country are unacquainted with the topographic maps issued by the United States Geological Survey. A most commendable, as well as a most attractive and efficient, way of acquainting those who should be interested in these maps has been begun by the National Highways Association in a Bulletin issued in May on Topographic Maps of the United States. The author of the pamphlet is W. M. Davis, of Harvard, and this authorship bespeaks not only an accurate but a most interesting and simple account of the maps and how to read them. The pamphlet contains 16 figures, each representing a part of a typical landscape, printing in the usual colors. They are exact copies of the government originals. The series in this Bulletin are taken from the states of New York, New Jersey, Pennsylvania, Ohio, Maryland, Virginia, West Virginia, South Carolina and North Carolina. Under each figure is an interpretation of the physical geography of the region shown. A limited number of these Bulletins may be had, free of cost, from the National Highways Association, South Yarmouth, Mass. The Association proposes to issue other Bulletins of a similar nature, covering other parts of the country.

Soil Survey of the Camden, N. J., Area.—A new Soil Survey bulletin of the Camden area has just been issued by the Bureau of Soils, U. S. Department of Agriculture. This area covers the territory from Palmyra and Mt. Holly on the north to well south of Elmer and Hammonton on the south. The Survey contains a soil map in colors, superposed on the topographic map of the region, as is usual in the soil survey reports. In addition, there are several half-tone illustrations and a relief map of the state.

The Survey contains much of interest in local geography. "The character of soil and topography," the bulletin tells us, "has had a marked influence from place to place upon the crops grown, the agricultural industries, methods of production, and the size of farms." "There are few areas in the United States where the soils are more generally used in accordance with their particular crop adaptations than in the Camden area. The favorable location with respect to large markets and excellent transportation facilities are factors which have in large part made possible the general practice of using the soils for those crops to which they are naturally best suited." For example, certain light sandy soils "are peculiarly associated with the production of early vegetables, such as tomatoes, asparagus, sweet potatoes, cantaloupes, peas, beans and egg plant. The sandy loams are generally used for medium to late vegetables, tomatoes for canning, cabbage and peppers," and also for peaches, apples, and pears. Another soil type gives rise to general farming;

dairying is found on still another. "Poultry raising is largely confined to the Sassafras sandy loam. Cranberries are grown only on the Hyde loamy sand." Large areas of white sand are covered with scrubby growths of little value, where farming is of small consequence. Special crops have been highly developed in certain areas, as the small fruits around Hammonton, peppers about Newfield and Malaga, fruit's about Glassboro and Moorestown. All of these facts offer interesting geographic responses near at home that easily can come under the observation of members of the Society. Local material of this kind should not be neglected by members of the Society for the things that are far away. There is enough geography at our very doors to keep us occupied.

Meat Packing in Brazil.—Brazil has long been one of the great cattle raising regions of the world, but only recently has advantage been taken of this for the development of a meat packing industry. Heretofore, practically the only method of marketing meat was as "jerked beef." Within recent years several large refrigeration plants have been erected in or near Sao Paulo and in other of the southern states. The last movement in this direction is now being carried out by Armour & Co., who are erecting a plant four miles from the city of Sao Paulo to handle 2,000 cattle, 3,000 hogs and 2,000 sheep a day. The factory, when completed, will employ over 3,000 hands. This same company already has a plant in Brazil near the Uruguay boundary. These plants, with the ones already established by other Chicago firms, as well as firms from other parts of the world, are rapidly making the exports of meat from Brazil an item of very considerable importance.

Coal Carried to Cincinnati on Artificial Flood.—Floating on the crest of an "artificial flood," a fleet of Ohio River barges on August 14 reached Cincinnati with 13,000 tons of coal. Never before under similar conditions has the Ohio River seen such an event in August, and it is only because man has stepped in to aid nature that it has occurred. This quantity of coal would have required 350 railroad cars.

As always is the case at this time of the year, the Ohio is in extremely low water. Boats drawing more than a couple of feet are normally tied up. But the United States Army Engineering Corps, wishing to demonstrate the supreme value of the river as an artery of traffic in war time, stepped in with an illuminating illustration of what can be done even in these weeks of scant flow. Dams holding back pools along the Big Sandy, the Kanawha, and the upper Ohio Rivers were opened a few days ago, and surplus water was allowed to run out. An artificial crest of 3 to 6 feet was formed, and on this crest fleet's bore to Cincinnati the fuel so urgently needed. Without the presence of the dams that the government has already completed, this movement and others which will undoubtedly follow could not be made.

Colonel Beach, United States engineer in charge of the Cincinnati district, dcelares that last November, when there was a perilous shortage of coal